

# DHRUMIL SHAH

## CURRICULUM VITAE

Mobile Number: (+91) 9867672731

Email ID: dhrumil303@gmail.com

402, Anand Enclave, Santacruz (East)

Mumbai - 400055, India.

---

### RESEARCH INTERESTS

---

Catalysis, Reaction Engineering, Energy Engineering, Process Intensification, Process Design, Sustainable Engineering

---

### EDUCATION

---

**B.Tech, Chemical Engineering** | Indian Institute of Technology Bombay | GPA: **9.11/10** '15 - '19

- Awarded the highest **AP** grade (1 out of 63 students) in the course **Materials Sciences** Nov '18
- Minor degree in Computer Science and Engineering (Key courses: Machine Learning, Data Structure and Algorithms)
- Honors in Chemical Engineering (Key courses: Sustainable Engineering Principles, Advanced Reaction Engineering)

**Intermediate Examination** | Pace Jr. Science College Borivali, University of Mumbai | Performance: **90.92%** '13

**Matriculation** | Lilavatibai Podar Senior Secondary School | Performance: **94.5%** '11

---

### KEY PUBLICATIONS AND HONORS

---

- **Learnings from Pratham, First Student Satellite of IIT Bombay** | Co-author '18  
Full paper selected in International Conference on Small Satellites 2019
- **Institute Technical Roll of Honor** | Awarded to 1 out of 2,400+ graduating students of IIT Bombay '15-'19  
For the overall contribution towards technical culture in IIT Bombay over the past 4 years
- **Institute Technical Person of the Year** | Awarded to 2 out of 10,000+ on-roll students of IIT Bombay '18  
For finalizing the payload of Advitiy, IIT Bombay's 2<sup>nd</sup> student satellite, after providing proof of concept and contributions towards establishing a new technical club, Ham Radio Club, IIT Bombay
- Presented Pratham, IIT Bombay student satellite project at Harbin Institute of Technology, China in the *Technical Forum on Student Micro/Nano-Satellites* '17
- **Hostel Technical Color** | Awarded to 3 out of 300+ hostel students of IIT Bombay '17  
For above par contribution towards hostel technical culture, winning the Inter-Hostel Overall General Championship

---

### KEY RESEARCH/ TECHNICAL PROJECTS

---

**Dry Reforming of Methane** | B.Tech Project Sep '18 - Present  
Guide: Prof. Sanjay M. Mahajani, Chemical Engineering Department, IIT Bombay

- Designed and established a setup for gas-solid heterogeneous reaction to occur at 800 °C based on furnace heating, with reactants being carbon dioxide and methane aimed to achieve high conversion
- Synthesized catalyst for the reaction and analyzed the same for BET Surface area, X-ray diffraction, Chemisorption and Temperature Programmed Desorption to assess the reaction mechanism on the catalyst
- Experimentally established almost zero conversion using Gas Chromatography in the absence of catalyst keeping all the other reaction conditions conducive for the reaction hence proving the need for catalyst
- Achieved close to 99% conversion at 800 °C with H<sub>2</sub>:CO ratio at 1:1, establishing proof of concept of the reaction

**Emitter Array for Nanosatellite Ion Thruster** | Mitacs Globalink Research Internship May '18 - Jul '18  
Guide: Prof. Fabio Cicoira, Chemical Engineering Department, École Polytechnique de Montréal

- Developed a Polydimethylsiloxane (PDMS) mold to be used to design emitter arrays on carbon xerogels
- Refined the Resorcinol-Formaldehyde based carbon xerogel synthesis process from 2 weeks synthesis time to 5 days
- Proposed various possible applications of carbon xerogels (due to its high specific surface area) in areas such as supercapacitors, catalysis etc. and devised possible synthesis procedure to meet these applications
- Designed a low cost strain gauge based weight measurement device for measuring the thrust produced by the microthruster which is of the order of few millinewtons

## IIT Bombay Student Satellite Project | Payload and Ground Station Segment

### **Advitiy, 2<sup>nd</sup> student satellite of IIT Bombay**

May '17 - May '18

*Advitiy is the next step after Pratham with the mission of making a 100% reliable, repeatable satellite bus*

- Finalized Advitiy's payload (transmission of image in SSTV protocol and reception by low cost DIY receiver) after analyzing 30+ payload ideas, considering the mission statement, impact and social goal
- Designed and implemented the prototype to test the end to end link of image transmission and reception in SSTV protocol, establishing the proof of concept of Advitiy's payload
- Developed a Payload wiki structure for the benefit of the institutes aiming to start their own Student Satellite Project; acknowledged by AMSAT-UK, world's largest organization for amateur satellites

### **Pratham, 1<sup>st</sup> student satellite of IIT Bombay**

Feb '16 - Apr '17

*Launched on-board PSLV-C35 in Sep '16, Pratham was designed and built exclusively by the students of IIT Bombay*

- Designed an automated ground station to receive signals in amateur frequency range from more than 100 satellites operating in the amateur radio frequency bands
- Optimized the communication link by experimenting with different configurations of low-noise amplifiers and bandpass filters and to receive signals upto -70 dBm

---

## INDUSTRIAL EXPERIENCE

---

### **Overview of Indian Chemical Industries**

Dec '17

**Guide:** Prof. Sanjay M. Mahajani, Chemical Engineering Department, IIT Bombay

- Examined 10+ industries of different sectors aimed to understand chemical processes implemented practically
- Discussed the role of technology, economics, and safety in plant design with leading industry experts belonging to 5+ sectors including pharmaceutical, petrochemical and equipment fabrication sectors as part of interactive sessions
- Simulated Gas processing plant of GAIL India Ltd. located in Gujarat, India, using DWSIM; determined optimum working conditions constrained to meeting technical specifications as part of a course project
- Documented a report on Reliance Jamnagar Oil Refinery, world's largest oil refinery, detailing on-site oil processing as well as brief insight into the background of the company as part of a 3-member group project

---

## SELECT COURSE PROJECTS

---

### **Technocommercial Analysis of 10 kTPA plant for Glyphosate**

Jan '18 - May '18

**Guide:** Prof. Sanjay M. Mahajani

**Course:** Technocommercial Aspects of Fine and Specialty Chemicals

- Presented an economic as well as technical based proposal for building a 10 kTPA plant for glyphosate production after considering its current market demand as well as current producers
- Analyzed and compared 3 commercially established processes and designed a process using the hydrogen cyanide process of production as a base process
- Defined various quality tests to assure meeting of quality as expected in market
- Using principles of basic economics, evaluated the plant to produce returns of investment at a rate of 21.24% per annum leading to a payback period of 2 years and 11 months, making it a promising venture

### **Life Cycle Assessment of production of Dimethyl Ether from Biomass and Coal**

Jul '18 - Dec '18

**Guide:** Prof. Yogendra Shastri

**Course:** Sustainable Engineering Principles

- Estimated the environmental impact of production of dimethyl ether from two raw materials - biomass and coal
- Defined functional unit for comparison between the two processes, defined system boundaries for unbiased comparison of impact; analyzed the environmental impact using OpenLCA for the inventory estimated per kg of product

### **Systems Engineering Analysis for Redevelopment of Hostels**

Sep '17 - Nov '17

**Guide:** Prof. Hemendra Arya

**Course:** Systems Engineering Principles

- Proposed a systems-level plan for redevelopment of hostels keeping in mind all the constraints imposed by external factors; prepared a functional decomposition for complete execution of the project
- Enlisted stakeholders of the system and incorporated their demands and formulated them as requirements and proposed test plans for identified needs

---

## LEADERSHIP EXPERIENCE

---

### Co-Founder and Manager, IIT Bombay Ham Radio Club

*May '17 - Apr '18*

- Instituted a first-of-its-kind club in IIT Bombay for aiding national disaster relief operations using radio-based communication, when all other forms of communication fail
- Fostered a diverse pool of 100+ people having different interests comprising both undergraduate and post-graduate students from inside as well as outside the campus
- Formulated the constitution of the club, devised the team structure and the roles and responsibilities of the various positions within the club

### Project Manager, Team Zero Waste

*Feb '18 - Present*

A project under supervision of Tata Centre for Technology and Design, IIT Bombay guided by Prof. Sanjay Mahajani, aimed towards mitigation of Solid Waste produced in the campus

- Founder and Project Manager of Team Zero Waste, a multi-disciplinary team of 15+ students, aimed to create a model in the institute to minimize solid waste to landfill
- Defined technical approach considering the diverse challenges in managing more than one type of waste generated in the institute
- Executed 2-tier recruitment process recruiting 13 students out of more than 50 students evaluating technical aptitude
- Enabled establishment of **proof of concept** of conversion of lemon waste generated in mess to a cleaning solution that can be used to clean floors as well as utensils
- Organized 2-day “Zero Waste Symposium” in the campus to discuss challenges in achieving Zero Waste at various levels of community, involving 10+ speakers and panelists from different sectors: industries, residential colonies, government, and academia, attended by officials from BASF, BMC, Atul Ltd. etc.

---

## MENTORING AND TEACHING EXPERIENCE

---

### Institute Student Mentor and Department Academic Mentor

*Jul '18 - Present*

- Awarded ISMP Special Recognition for exemplary work as a mentor (Awarded to 7 out of 92 mentors)
- Involved in guiding twelve mentees in solving their academic and personal problems
- Involved in inspiring and motivating 3 mentees under the Academic Rehabilitation Program to improve academically
- Attended a one day workshop organized by Tata Institute of Social Service (TISS) to learn different skills required for mentoring

### Teaching Volunteer at Abhyasika

*May '16 - Apr '17*

- Spent 50+ hours volunteering at Abhyasika, an NGO which offers quality education to underprivileged children; tutoring IIT-Joint Entrance Exam Physics to Class 12 students

---

## RELEVANT SKILLS

Programming Languages	C++, Arduino, HTML
Software	DWSIM, OpenFoam, MATLAB, ANSYS, SOLIDWORKS, Eagle, L <sup>A</sup> T <sub>E</sub> X, MS Office
Equipment Experience	Gas Chromatograph, Radio Transceivers

---

## REFERENCES

---

### Prof. Sanjay M. Mahajani,

B.Tech Project Guide,  
Department of Chemical Engineering,  
Indian Institute of Technology, Bombay.  
**Email:** sanjaym@che.iitb.ac.in

### Prof. Fabio Cicoira,

Professor In-charge, Polytechnique Montreal,  
Department of Chemical Engineering,  
École Polytechnique de Montréal.  
**Email:** fabio.cicoira@polymtl.ca

### Prof. Varun Bhalerao,

Faculty Advisor, Student Satellite Project,  
Department of Physics,  
Indian Institute of Technology Bombay.  
**Email:** varunb@iitb.ac.in