

AYUSH SINHA

Senior Undergraduate
Mechanical Engineering
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EDUCATION

Qualification	Institute	Year	Performance
BTech Mechanical Engineering	Indian Institute of Technology Kanpur	2013-2017	CPI 9.3
Intermediate (12th CBSE)	Delhi Public School, Indira Nagar, Lucknow	2013	92.4%
High School (10th CBSE)	Delhi Public School, Indira Nagar, Lucknow	2011	CGPA 10

RESEARCH INTERESTS

Robotics, Mechanical Design, Biomimetics

PUBLICATION

A. Spröwitz, K. Petersen, C. Göttler, **A. Sinha**, C. Caer, and M. U. Öztekin, “Scalable Pneumatic and Tendon Driven Robotic Joint Inspired by Jumping Spiders”, manuscript submitted for publication

INTERNSHIPS

- **MAX PLANCK INSTITUTE FOR INTELLIGENT SYSTEMS, STUTTGART**
GUEST SCIENTIST (May 2016 – July 2016)
Project Title: “*Scalable Pneumatic and Tendon Driven Robotic Joint Inspired by Jumping Spiders*”
Project Supervisors: Dr. Metin Sitti, Dr. Alexander Spröwitz, Dr. Kirstin Petersen
 - Developed a novel leg-joint mechanism employing both pneumatics and electrically-actuated tendons with its implementation closely inspired by joints seen in real spiders
 - Designed and fabricated mechanical analogues of spider-leg joints using inferences drawn from scanning-electron microscope images of real spiders developed by another collaborator
 - Built cam-based cable-driven quick release mechanism to mimic the flexor muscles in spiders
 - Designed and molded soft rubbery joints for their comparison against proposed spider-inspired joints
 - Built two experimental setups for characterization of the system under static and dynamic conditions
- **TATA MOTORS LIMITED LUCKNOW**
SUMMER INTERN (May 2015 – June 2015)
Project Title: “*Problem resolution and Root Cause Analysis for specified part belonging to vehicle’s chassis*”
Project Supervisor: Mr. Naveen Agnihotri
 - Operated in Supplier Quality department to resolve a recurring fitment issue for a particular cross-member
 - Identified possible causes of defect in its complete manufacturing process which led to the fitment issue
 - Altered the riveting fixture and replaced the worn out punch of bending press to eliminate the defect

PROJECTS

- **ROBOCON 2015 – ROBOMINTON**
NATIONAL ROBOTICS CONTEST (Centre for Mechatronics, IITK) (September 2014 – March 2015)
 - Designed and built two badminton playing robots for doubles match on an actual size court
 - Synthesized mechanisms for racket actuation to implement various badminton strokes
 - Designed a pneumatically powered double actuation mechanism which replicates the combined motion of the elbow and wrist joints while playing a badminton stroke
 - Selected suitable pneumatic pistons and motors for driving the mechanisms with required speed and force
 - Implemented holonomic drive using omni wheels to provide three degrees of freedom to the chassis
 - Finished Eleventh in eighty-five teams representing different universities from all over India
- **MECHANICALLY ACTUATED GARBAGE COMPACTOR**
DEPARTMENTAL PROJECT (Dr. Bishakh Bhattacharya, Mechanical Engineering, IITK) (August 2016 – Ongoing)
 - Aim at developing inexpensive and robust garbage compressing solution for Indian circumstances
 - Designed mechanism for amplifying user input force without using electronics or hydraulics
 - Current design generates 1635N output for an input of 300N and achieve compression factor of five

▪ **DEVELOPMENT OF PENNATE MUSCLE INSPIRED ACTUATOR USING SHAPE MEMORY ALLOY WIRES**

COURSE TERM PAPER (Smart Materials and Structures)

(January 2016 – April 2016)

- Designed Shape Memory Alloy (SMA) based actuator inspired by the functioning of pennate muscles
- Established kinematic and force formulations for the SMA based actuator
- Determined relations between actuator characteristics like resultant force, displacement and actuation time

▪ **HAND HELD DRY CLEANER (CLEANEASY)**

DESIGN PROJECT (New Product Design and Prototyping)

(January 2016 – April 2016)

- Identified substantial untapped market needs with subsequent ideation of profitable solutions
- Developed design and prototype of a novel device capable of performing all stages in dry cleaning process
- Performed and analysed market survey to identify potential customer segments and tuned product accordingly
- Pitched idea along with business plan to ME department and won monetary grant for first stage prototyping

▪ **THERMODYNAMIC ANALYSIS OF SOLAR POWERED CLOSED CIRCUIT VAPOUR TURBINE**

SUMMER PROJECT (Dr. Santanu De, Mechanical Engineering, IITK)

(June 2015 – July 2015)

- Analysis of solar powered vapour turbine for production of electric power for domestic or small-scale use
- Development of Aspen HYSYS models and their efficiency comparison through simulations

▪ **MODEL OF AN SEMI AUTOMATIC CAR PARKING SYSTEM**

COURSE PROJECT (Manufacturing Processes Laboratory)

(January 2015 – April 2015)

- Prepared CAD design and fabricated a small-scale hand-driven model of an automatic car parking system
- Gained hands-on experience with basic machine-shop operations and conventional machining methods

AWARDS AND ACHIEVEMENTS

- Awarded **DAAD WISE 2016 Scholarship** for pursuing summer internship in Germany at MPI for Intelligent Systems
- Received **Academic Excellence Award** for the year 2013-14 at Indian Institute of Technology Kanpur
- Ranked among **Top 0.2% of 1.3 million** applicants in Joint Entrance Examination for engineering in India in 2013
- Ranked among the **Top 0.1%** of successful candidates in Physics in All India Senior Secondary Board Examinations
- Secured **City Rank 1** and **State Rank 8** in Science Olympiad Foundation's 14th National Science Olympiad
- Secured **All India Rank 41** in National Level Science Talent Search Examination 2012

KEY COURSES AND SKILLS

- **CORE** : Robot Manipulators: Dynamics and Control, Theory of Mechanisms and Machines, Design of Machine Elements, Finite Element Methods, Smart Materials and Structures, Mechanics of Solids, Vibration and Control
- **BREADTH** : Basics of Modern Control Systems, Fundamentals of Computing, Introduction to Electronics, Complex Variables, Ordinary Differential Equations, Partial Differential Equations, Matrix and Determinants,
- **SKILLS** : SolidWorks, Autodesk Inventor, AutoCAD, MATLAB, C, Latex, Web Development, Android Development

POSITION OF RESPONSIBILITY

- **SENIOR MEMBER – TEAM ROBOCON IITK 2015**
- Represented IIT Kanpur in National Robocon 2015 organized by Asia-Pacific Broadcasting Union
- Led a team of fifteen freshers to create two robots for playing doubles badminton matches against other teams
- Arranged exhibitions at IIT's technical festival Techkriti 2015 and annual Science and Technology Day of IIT Kanpur
- Felicitated by Science and Technology Council, IITK for contributions towards science and technical activities of institute

EXTRA CURRICULAR ACTIVITIES

- Designed Nitinol actuated self-assembling structures for participating in 'Lab2Moon' contest which challenges teams to construct a useful experiment which will be sent on the Moon by a participant of Google's Lunar XPrize contest
- Participated in Entrepreneur Summit IITK's 'Pitch Your Product' event in 2016 and presented our product in finale round
- Stood 1st in Wild Soccer in Takneek 2015 – the intra-institute technical festival of IIT Kanpur. The contest required the teams to build two robots aimed at playing soccer and destroying the opponent's robots
- Won the Stop-Motion Film making contest in Spectrum 2014 – the intra-institute film festival of IIT Kanpur