

# Ashutosh Mukherjee

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[Projects](#) [Website](#)

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## Education

10/2021 – Ongoing	M.Sc. Computer-Aided Conception of Machines in Mechanical Engineering <i>RWTH Aachen</i>	CGPA : 1, 8
8/2016 – 6/2020	B.Tech in Mechanical Engineering <i>Punjab Engineering College, Chandigarh</i>	CGPA : 8.3/10
4/2014 – 3/2016	High School (10+2) <i>Bhavan Vidyalaya, Chandigarh</i>	Percent : 94.4%

## Work Experience

### Master Thesis Student

**October 2023 - March 2024**

*Rheinmetall Technology Centre - New Technologies, Rheinmetall AG, Neuss, Germany*

#### **Distributed Data-Fusion and Control over a network of Unmanned Aerial Vehicles**

- Development of a simulation model of an integrated flight control system for a single UAV, including a flight controller, 6 degree-of-freedom UAV dynamic model, IMU, Magnetometer, Barometer and GPS sensor models and an Extended Kalman Filter for attitude estimation.
- Design of an attitude estimation filter based on attitude error rotation vector dynamics.
- Development of a localization algorithm for a network of GPS-denied UAVs using Ultra-wideband (UWB) sensors.

### Werkstudent (Working Student)

**June 2022 - September 2023**

*Rheinmetall Technology Centre - New Technologies, Rheinmetall AG, Neuss, Germany*

- Development of a mathematical model for the force analysis of a flexible electrostatic synchronous actuator based on the concept of *Method of Moments*, a discretization technique for electric fields.
- Maintenance of the developed mathematical model code-base, making use of software engineering principles like object orientation, version control and comprehensive code documentation

### Project Assistant

**October 2022 - April 2023**

*Institut für Getriebetechnik, Maschinendynamik und Robotik, RWTH Aachen*

- Scripting Multi-Body simulation models of a standard mountain bike in Simpack using the *Semi-Analytical Approach* where the multibody model partly depends on real-time sensing of loads on the actual bike.
- Setting up co-simulation between Simpack and Simulink in a closed loop simulation for stabilizing the multibody model of the bike excited by the measured loads.
- The work in this project culminated in a mini-thesis worth 9 ECTS, which can be accessed [here](#).

### Research Assistant

**September 2020 - July 2021**

*Thapar Institute of Engineering and Technology, Patiala, India*

- Dynamic modeling of a strength augmentation exoskeleton designed by *Defence Bio-Engineering and Electro-Medical Laboratory (DEBEL)*, a branch of *Defence Research and Development Organization (DRDO)*, India

- Modeling of Human and Lower Extremity Exoskeleton in the form of a coupled multi-body system with the human as leader and the exoskeleton as follower.
- Development of a Computed Torque Control algorithm for strength augmentation.
- Various sections of the work done for this project are being submitted in various journals and conferences related to Biomechanics and Multi-Body Dynamics, and all published work can be referred from *Conference Presentations and Publications* section.

## Teaching Assistant

February 2021 - June 2021

Thapar Institute of Engineering and Technology, Patiala, India

- Teaching Assistant for the graduate level course *Modern Control of Dynamic Systems*, which covers basic and advanced topics in linear systems theory like state-space representations, canonical forms, controller and observer design using pole-placement, and some concepts of optimal control theory.
- Helped set mid-term examinations and quizzes, and grade them as part of assistantship duties.

## Technical Skills

Programming	Computational Techniques
<ol style="list-style-type: none"> <li><b>Scripting Languages</b> <ul style="list-style-type: none"> <li>• MATLAB &amp; Simulink</li> <li>• Python</li> </ul> </li> <li><b>Programming Languages</b> <ul style="list-style-type: none"> <li>• C++</li> <li>• Java</li> </ul> </li> <li><b>Markup Languages</b> <ul style="list-style-type: none"> <li>• HTML</li> <li>• LaTeX</li> </ul> </li> <li><b>General</b> <ul style="list-style-type: none"> <li>• Object-Oriented Programming</li> <li>• Version Control using Git</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>Multi-Body Dynamics</li> <li>Finite Element Analysis (Static and Dynamic)</li> <li>Regression and Classification using Neural Networks</li> <li>Boundary Element Method in Electrostatics (Method of Moments)</li> <li>Strapdown Algorithms for Inertial Navigation</li> <li>State Estimation using Extended-Kalman Filters</li> <li>Sensor Fusion</li> <li>Numerical Integration and Differentiation using implicit and explicit schemes and stability analysis of explicit techniques</li> </ol>

## Conference Presentations and Publications

- Chander, S., Mukherjee, A., & Singla, A. (2023, July). *Estimation of Ground Reaction Force for Coupled Dynamic Modelling and Control of the Lower-Limb Exoskeleton*, AIR 2023: Proceedings of the 2023 6<sup>th</sup> International Conference on Advances in Robotics, July 2023, Article No.: 37, Pages 1-8, [DOI](#)
- Chander, S., Mukherjee, A., Shivling, V., & Singla, A. (2022, October 16-20). *Modelling and Validation of Human Gait Dynamics using Modified Euler-Lagrange Approach* [Paper Presentation], 6<sup>th</sup> Joint International Conference on Multibody System Dynamics and 10<sup>th</sup> Asian Conference on Multibody Dynamics, New Dehli, India, [URL](#)