Jobanpreet Mutti

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EDUCATION

University of California, San Diego
Mechanical Engineering Master's (In progress) — *September 2025 - June 2027*

University of California, Berkeley
Mechanical Engineering Bachelor's, Aerospace Engineering minor — **GPA: 3.5** — *August 2020 - May 2024*

San Jose City College
Laser Technology Certificate — **GPA: 3.8** — *August 2024 - June 2025*

SKILLS

MATLAB, Simulink, Python, ROS 2, Embedded Systems (Arduino, STM32), Experimental & Mechanical Testing (Instron), Laser Alignment & Optical Metrology, SolidWorks, AutoCAD, ANSYS, FDM 3D Printing, Linux, Excel, Word

WORK EXPERIENCE

ALFATECH (Mechanical Designer, E.I.T) — *June 2024 - July 2025*

- Drafted permit-ready mechanical drawings in **Revit** and **AutoCAD** in accordance with engineering standards.
- Collaborated cross-functionally with architects, vendors, and contractors to resolve design constraints under tight project timelines.
- Performed thermal load calculations using **HAP** to support thermal and HVAC system design decisions.

PROJECTS

Handheld Semi-Automatic Router

- **Won** Electromechanical Design/Electronics and Controls Award.
- Collaborated with a team to develop a router that corrected user error and cut out shapes to high precision.
- Installed and calibrated several stepper motor drivers (A4988, TMC2209, TB6600, etc.) and **microcontrollers** (ESP32, Arduino Uno), developed goal tracking control code, and worked with teammates to finalize inertial position tracking utilizing theory from rigid body planar dynamics.

2 axis Camera Gimbal (in progress)

- Successfully integrated and closed the control loop for one gimbal axis on a **STM32**, implementing quaternion-based orientation tracking to avoid Euler-angle singularities (gimbal lock) and maintain smooth, continuous rotation under dynamic disturbances. Currently expanding to 2-axis by **modelling the gimbal as a 2-revolute arm robot arm** and utilizing the pseudoinverse to convert commanded angular velocities to corrective joint velocities.

Controls Course Projects

- Modeled and simulated traction, lateral, and stability control for a vehicle model in **Simulink**, emphasizing feedback control design and performance validation.
- Designed, simulated, and validated **full-state feedback controllers** for an inverted pendulum system by linearizing nonlinear dynamics and performing **pole placement in MATLAB/Simulink**. Compared simulated and hardware responses, analyzed discrepancies due to unmodeled dynamics, and refined control design accordingly.
- Developed and implemented a **Luenberger observer** to estimate unmeasured states (cart velocity, pendulum angular velocity), improving robustness and noise sensitivity compared to numerical differentiation. Evaluated estimator convergence and documented performance improvements.
- Created and tuned an **analog lead–lag controller** for an electromagnetic levitation system by identifying plant parameters through empirical data collection, fitting linearized models, and adjusting pole–zero locations.
- Identified PWM→speed (linear) and speed→thrust (quadratic) motor models via regression and implemented thrust mapping in **C++** for quadcopter control allocation.
- Implemented sensor state estimators (gyro bias calibration + complementary filter + height/optical flow fusion) and experimentally tuned time constants to achieve **stable closed loop hover** for a quadcopter.

RoboJeep — ROS 2–Integrated Electromechanical Vehicle Platform

- **Designed** and **integrated 3D-printed custom mounts** to secure **Jetson Nano, Arduinos, H-bridges,** and sensors into a simple prebuilt powerwheel.
- Constructed and launched a **Dockerized ROS2** workspace and integrated serial bridges to **Arduino** controllers for real-time vehicle control and debugging.
- Characterized **magnetic encoder performance up to 9,600 RPM** and validated accuracy by confirming linear proportionality between encoder applied voltage and angular speed ($V = k \cdot \omega$).
- Procured and integrated **magnetic encoders** (AS5600) across four drive motors and incorporated a hardware fail-safe E-stop that disables the 5V enable signal to all motor drivers.