Michael Raba, MSc

Mechanical Engineering
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Featured Projects

1. Multichamber Muffler Design 2023

- Designed a multichamber muffler system with internal components including chambers, baffles, perforates, and fiberglass absorbents.
- Simulated acoustic performance using industry-standard tools including ANSYS 2023 (Acoustics Module) and SIDLAB 5.1 (1D approximation).
- Modeled transmission and insertion loss across 0–1000 Hz using fluid approximations and validated against measured data using TL and IL metrics.
- Created CAD-style schematics and published downloadable simulation files for reproducibility and benchmarking.

2. Viscoplastic Modeling 2023

- Applied Anand's viscoplasticity model to simulate strain-rate and temperature-dependent behavior of solder alloys on microchip packages.
- Developed a Forward Euler integration scheme in Python to solve constitutive equations and model stress evolution to verify ANSYS nonlinear models.
- Performed material parameter fitting based on experimental data using Python NumPy.

3. Electromagnetics Simulation: Finite Difference Time Domain 2019

- Calculated 3D space location of a particle in a magnetized fluid flow using the Yee Scheme.
- Implemented finite difference equations and staggered time-stepping for a Navier Stokes Simulation.

4. MSc Project – POD Analysis of Turbulent Pipe Flow 2023

- Developed a MATLAB-based framework to analyze turbulent rotating pipe flow using Proper Orthogonal Decomposition (POD).
- Compared Classic and Snapshot POD methods to extract dominant energetic structures and reconstruct flow fields from 5 Terabytes of data.
- Tools Used: MATLAB, Python, C++, fortran2020, linux.

Employment

Research Assistant 2020 – 2023
University of Kentucky *Lexington, KY*

- Collaborated with 11 PhD students at University of Maryland, College Park and University of Oxford.
- Attended AIAA Aviation and Aeronautics Forum in Chicago, IL (2022).

Teaching Assistant Fall 2020 & Spring 2023
University of Kentucky *Lexington, KY*

- TA for ME311 Experimental Design II (DOE), a senior level course covering Heat Transfer, Fluid Mechanics, Statics, Engineering Statistics, and R.
- Taught ME 330 Fluid Mechanics I as an undergraduate and ME 321 Thermodynamics II as recitation leader.

Wayfinding Assistant 2019 – 2020, July 2023 – Present
Chandler Medical Center *Lexington, KY*

- Developed custom wayfinding map app to assist hospital visitors using Flask, Python, and SQL.

Education

University of Kentucky Expected Dec 2025
MSc in Mechanical Engineering (GPA: 3.3) *Lexington, KY*

University of Kentucky May 2019
BA in Mathematics (In-major GPA: 3.6) *Lexington, KY*