

# Resume

## Michael B. Rooney

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Mechanical Engineer with a background in vehicle dynamics, analytics, mechanical design and professional motorsport. Endless hours spent behind drawing boards and working with competitive technical teams have fueled my passion for engineering over the last 10 years. Outside the office, you can usually find me tinkering with arduino projects, mountain biking, wakeboarding, snowboarding, or playing ice hockey.

### EDUCATION

### AWARDS

**University of British Columbia [Vancouver, BC, Canada]**  
*Bachelors of Applied Science in Mechanical Engineering*  
*Graduation May 2013*

**Oxford Brookes University [Oxford, England]**  
*Masters of Science in Motorsport Engineering*  
*Graduation Sept 2014 with Distinction*

**Carroll Smith Memorial Shield & Mercedes AMG Petronas Formula 1 Design Award**  
*Presented vehicle dynamic design for the Oxford Brookes Racing team*      *Design Competition UK May 2014*

### SOFTWARE / TECHNICAL SKILLS

CAD Packages	Computer Software	Technical Projects
SolidWorks & FEA Package	Microsoft Office Suite (Excel VBA / Power Query / SQL / Power BI)	Diagnostic analytics from telemetry systems
Catia V5 / Surface Modeling	MATLAB & Simulink / GUI Development	Vehicle component design projects using FEA
NX Unigraphics 7.5 Simulations & FEA Package	Visual Studio 2017 (C++/VBA Beginner)	Excel Power Query / Power BI analytics
MSC Adams	Claytex Dymola Multibody Simulation Systems	Mathematical Modeling / visualization Matlab GUIs
Star CCM+ CFD Software	Pi Cosworth / Workshop / Toolbox	CAD/CAM rapid prototyping and core/cavity design
Hyperworks / Hypermesh	Pratt & Miller Timing & Scoring / Lap Time Simulation	Parametric CAD design projects with topology optimization
	AutoCAD	Wind tunnel aerodynamic analysis
		Vehicle physics modeling in Dymola

### WORK EXPERIENCE

Pratt and Miller Engineering (PME) *Jan 2015 – July 2018*  
*New Hudson, MI*  
**IndyCar Chassis Support Engineer to Team Penske**

- Worked on advanced analytical vehicle simulation models (Matlab / Dymola) in order to optimize aerodynamic / gearing configurations throughout testing and race weekends.
- Created visually appealing timing and scoring reports after race sessions. Original ASCII data post processed with Microsoft Power Query and Power BI. Advanced analytics / statistical analysis performed in Matlab and Microsoft Excel.
- Provided diagnostic analytics from vehicle telemetry in order to help optimize vehicle setup changes. Example vehicle telemetry sensors include internal IMU's, suspension damper pots, slip angle sensors, and a number of engine parameters.
- Conducted lap-time simulation and competitive analysis (for each event) to aid PME IndyCar program support development. Worked with team members to write in-season pre-event reports documenting simulation analysis and detailed aerodynamic recommendations for key-partner teams.
- Scripted/developed Matlab GUIs to aid weather predictions at the Indianapolis Motor Speedway, as well as underway pressure tap analysis. This was used in conjunction with detailed lap time simulation in order to predict top speed and gear selection.

#### **Simulation Support Engineer**

- Worked on development of IndyCar Dymola physics model for use in open, closed, and driver in loop (DIL) simulation. Work included vehicle suspension kinematic / dynamic design development, system development, correlation to physical testing, and tire development.
- Provide team support during Penske test days to assist DIL correlation and future event preparation.
- Worked with various Dymola Modelica packages including VDLMotorsports and Modelon to create vehicle physics model and testing environments for sub-assemblies.

Analytic Systems - Race Energy

Jul 2013 – Sept 2013, Oct 2014

**Race Engineer / Pit Crew for SCCA GT3/GTL Race Team**

Vancouver, BC, Canada

- Assisted Chief Mechanic in vehicle preparation and setup for race events. Projects included electrical wiring, engine diagnostics, various part disassembly / inspection and repair.
- Designed and manufactured a custom tuned 4-1 exhaust for a GTL 1.6L 4 cylinder engine. Design done in SolidWorks and manufactured in-house.
- Worked as a trackside engineer during races. Duties included vehicle setup and preparation work, as well as control systems and overall vehicle checks for race vehicles.
- Provided shock and damper analysis of suspension system during race weekends. Analytics done in Microsoft Excel.

Zodiac Hurricane Technologies

Jan 2012 – Apr 2012

**Design Engineer**

Vancouver, BC, Canada

- Worked with senior design engineers on marine military design projects. ISO 9001 standards adhered to for all projects. Responsible for misc. design projects from concept phase to final product, while working with shop tradesmen.
- Designed various boat / hull components in SolidWorks; all components managed by use of PDM works.
- Coordinated with shop tradesmen to ensure good communication when designing new parts for fabrication.

TECHNICAL PROJECTS

(<https://michaelbrooney.wixsite.com/resume/blog>)

IndyCar Chassis Support Engineer

Jan 2016 – July 2018

**Matlab Graphical User Interfaces (GUIs)**

- Scripted/developed Matlab GUI to aid weather predictions at the Indianapolis Motor Speedway. Historical weather data used in conjunction with current data to predict weather patterns around the track. Results were numerical & visual. This was used with detailed lap time simulation in order to predict top speed, aid gear selection, and aid shifting strategy.
- Scripted/developed Matlab GUI to aid underwing pressure tap analysis. Underwing pressure tap data read from vehicle telemetry system, post-processed and viewed as a 3D color / contour map. Used to efficiently and quickly compare underwing pressure differences between two separate outings, at specific locations around a track.

MSc. Motorsports Engineering at Oxford Brookes University

Sept 2013 – Sept 2014

**Dissertation Project**

- Front suspension kinematic and dynamic design for a club racing series vehicle as proposed by Dallara Automobili.
- Deliverables included full front suspension geometry and design, as well as component selection and performance estimations including MSC Adams 2-post rig simulation of front suspension for spring/damper selection. Analytical Simulink Matlab model created to correlate MSC Adams simulation model.

**Design Projects**

- Straight line vehicle acceleration performance model (created in Excel). Engine power, weight transfer, tyre inertia, aerodynamics, and friction taken into account.
- Simplified two-wheel vehicle model created in ADAMS software to model vehicle yaw rate response at various speeds. Vehicle response analyzed through derivatives analysis.
- Quasi-static lap time simulation model created for a 250cc super kart. MATLAB code created to take previous telemetry to create a track map based on instantaneous curvature. Project goal was to optimize final drive ratio for the kart.
- Catia V5 go-kart body modeling project. Body surface model created around a generic go-kart. A core & cavity mold was created for the body in Catia, and a list of CAM operations were programmed. Final model was created as a 1/20<sup>th</sup> scale rapid prototype model.
- Catia V5 2-stroke engine model design project. Experience using digital mockup kinematics and assembly design.

Oxford Brookes Racing (OBR) FSAE Collegiate Design Series

Sept 2013 – Sept 2014

**Drivetrain Design Engineer / Vehicle Dynamics Engineer**

- Designed various components for the 2014 OBR drivetrain. Most notably the rear bulkhead for the vehicle, which ties in wishbone hard points as well as provides an engine mounting location. Designs and FEA completed in SolidWorks.
- Created a full dynamic model of the OBR 2014 vehicle in MSC Adams in order to justify spring / ARB selection.
- Responsible for overall vehicle setup, race engineering and damper tuning.

Formula UBC. FSAE Collegiate Design Series

Sept 2008 – Apr 2013

**2009-2010 Chassis Team Leader, 2011-2013 Co-Team Captain**

- Managed 7 sub-groups of the team. Worked with sub-team leaders to plan & schedule design/fabrication milestones.
- Responsible for chassis fabrication and designed custom assembly fixtures and tooling projects.
- Sr. project involved the design, fabrication, and implementation of a front & rear wing aerodynamics package.
- Design challenges included airfoil design, material selection, manufacturing techniques, and design justification.