



University of Alabama at Birmingham

Vehicle and Robotics Engineering Laboratory

*The Home of Mechatronics*

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**The Vehicle and Robotics Engineering Laboratory (VREL)** develops multi-disciplined and multi-domain systems engineering approach to engineer vehicle and robotic mechatronic systems in partnership with academia, industry, government research agencies, and Intergovernmental International organizations.

### Mission

VREL provides conditions and equipment and facilities postgraduate, graduate and undergraduate research, works on contact projects with industry, and develops advanced academic and professional development courses and programs at all educational levels in the area on vehicle and robotic mechatronic systems engineering.

VREL provides an avenue for the new academic track in the Department of Mechanical Engineering: "Mechatronic Systems Engineering with application to Vehicle and Robotics Engineering"

### Main R&D Directions

#### Conventional/unmanned ground vehicles

- Agile and hyperactive vehicle/tire dynamics and control
- Coupled/interactive dynamics and design of open architecture vehicle systems
- Connectivity and automation for vehicle dynamics and powertrain control
- Cyber-protection of vehicle dynamics, intra- and inter-vehicle systems
- Mobility and survivability of terrain vehicle platoon/convoy
- Vehicle energy and fuel efficiency
- Vehicle performance and mission fulfillment optimization and control

#### Vehicle driveline/propulsion systems: optimization, control, and design

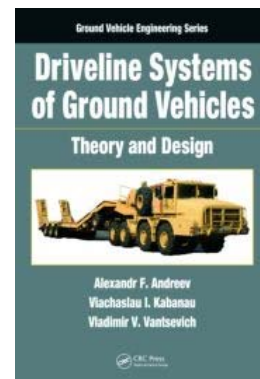
- Autonomous wheel power management system
- Multi-wheel, hybrid-electric, electric and hydraulic controllable drivelines
- Limited slip and e-locking differentials; transfer cases and drive axles
- Wheeled amphibious propulsion systems

#### Robotics

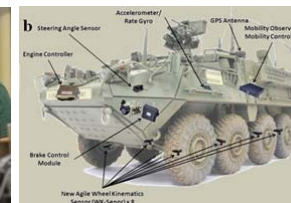
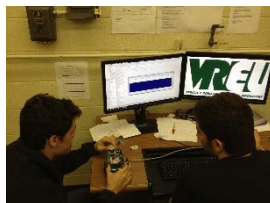
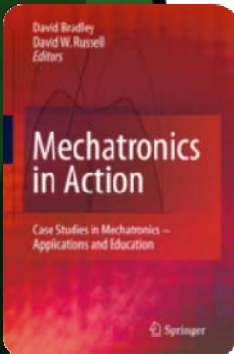
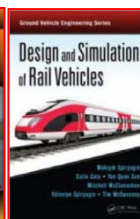
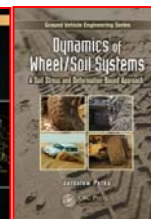
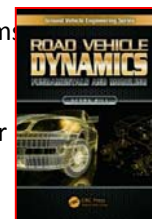
- Mechanical design of robots
- Dynamics and control with new expansion to Biomechatronics/Biorobotics (inverse approach)



**NATO ASI: Advanced Autonomous Vehicle Design for Severe Environments**



**Taylor and Francis: Ground Vehicle Engineering Book Series**



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