24nd International Conference On

ADVANCED VEHICLE TECHNOLOGIES

2022 ASME International Design Engineering Technical Conference (IDETC)

St Louis, Missouri August 14-17, 2022

Sponsored by: Vehicle Design Committee

Technical Research Areas: The Vehicle Design Committee (VDC) of the ASME Design Engineering Division (DED) is organizing an annual International Conference on Advanced Vehicle Technologies (AVT). Papers are invited on innovative analytical, computational, and experimental investigations in the design of full vehicle systems and their sub-systems, as well as on studies for safety and ergonomics, powertrains, alternative fuels, and intelligent transportation systems. Papers may address fundamental research, applied research, or successful implementations relating to light or heavy vehicle modeling, design, control, testing, or development.

Conference Chair: Costin Untaroiu Virginia Tech Department of Biomedical Engineering and Mechanics Email: costin@vt.edu **Conference Co-Chair: Luis Munoz** Universidad de los Andes Department of Mechanical Engineering Bogota, Colombia Email: lui-muno@uniandes.edu.co	**Program Chair: Ole Balling** Aarhus University, Denmark Department of Mechanical and Production Engineering Email: oba@mpe.au.dk

Symposium 1: Advances in Ground Vehicles Dynamics and Controls

Topics include advanced modeling methods and controls of multi-physics systems and multi-body dynamics, experimental evaluation and model validation tests, and advanced analytical and computational methods. Papers in the general area of dynamics and controls applications to vehicle systems and subsystems are welcome, including engine and transmissions, passive and controlled driveline and torque vectoring systems, ABS systems, active and semi-active suspension, intelligent rollover warning systems, active yaw control systems, emission control, vehicle drivability, intelligent transportation systems, and advanced propulsion control systems.

Organizer: **Corina Sandu:** csandu@vt.edu
Virginia Tech

Co-Organizer: **Siyuan (Hunter) Zhang**: zsy1010@uab.edu
University of Alabama at Birmingham

Co-Organizer: **Vladimir V. Vantsevich**: vantsevi@uab.edu
University of Alabama at Birmingham

Symposium 2: Advances in Modelling and Testing of Tires and Tire-Terrain Interaction
Topics relate to analytical, numerical, experimental studies of nonlinear behavior of tires and wheels including, but not limited to static/dynamic stress analysis, nonlinear material modeling, contact stress, impact, noise, vibration, traction, hydroplaning, performance evaluation, rolling resistance, handling, and durability. Tires of all sizes are of interest, for both on-road and off-road applications.

Organizer: **Hoda Mousavi:** hoda13@vt.edu
Virginia Tech

Co-Organizer: **Lin Li:** lin.li@nikolamotor.com
Nikola Corporation

Co-Organizer: **Mostafa Yacoub**: mostafa.yacoub@mtc.edu.eg
Military Technical College, Cairo, Egypt

Co-Organizer: **Zeinab El-Sayegh**: zeinab.el-sayegh@ontariotechu.ca
Ontario Tech University, Canada

Symposium 3: Advances in Methods for Ground Vehicle Systems Design
Topics refer to optimal, reliable, and robust design of vehicles and their subsystems, including, but not limited to design of suspension systems, powertrain design, braking systems designs, integrated (mechatronics) systems development, and engineering applications referring to vehicle design.

Organizer: **Massimiliano Gobbi**: massimiliano.gobbi@polimi.it
Politecnico di Milano (Technical University), Italy

Co-Organizer: **Lin Xu:** xulin508@whut.edu.cn
Wuhan University of Technology, China

Co-Organizer: **Lei Zuo:** leizuo@vt.edu
Virginia Tech

Symposium 4: Advances in Ground Vehicle Safety and Ergonomics
Topics include vehicle active safety such as adaptive cruise control, forward collision warning, lane departure warning or prevention, V2x technology developments, and passive safety developments of crashworthiness designs, accident reconstructions, restraint systems development & integration and robust structures for occupant and pedestrian protection during impacts (including under-body blast events). Other areas of research interest include the response and tolerance of the human body to vibration and impact, driver assistance systems, digital human modeling, human factors and driver behavior, critical technologies for future electronic certification of vehicle safety, safety concepts in autonomous vehicles, driver fatigue prediction, long distance driving comfort, biomechanics studies, experimental and computational analysis of ride comfort, and prediction of comfort levels.

Organizer: **Costin Untaroiu**: costin@vt.edu
Virginia Tech

Co-Organizer: **Alan Mayton**: amayton@cdc.gov
CDC/NIOSH/PMRD

Symposium 5: Advances in Vehicle Electrification and Powertrain Design
This symposium focuses on state-of-the-art research and development as well as future trends in the design, modeling, control, system integration and optimization of conventional and alternative energy propulsion and vehicular systems such as electric (EV), hybrid electric (HEV) and plug-in hybrid electric vehicles (PHEV), fuel cell vehicles, bio-fuel vehicles, LPG or CNG vehicles. Topics of interest also include energy storage and motor/power electronics components/systems, design and integration of the conventional and alternative energy propulsion and advanced vehicular systems, and state-of-the-art engine modeling and technology.

Organizer:	**Joel Anstrom**: janstrom@engr.psu.edu Penn State University
Co-Organizer:	**Angelo Bonfitto**: angelo.bonfitto@polito.it Politecnico di Torino(Technical University), Italy
Co-Organizer:	**Venkat Ramakrishnan:** venkat.ramakrishnan@fcagroup.com FCA Group

Symposium 6: Advances in Light Vehicles Design
Topics of the symposium are advanced modeling, simulation, testing, and identification methods for light vehicles including bicycles, motorcycles, three-wheeled vehicles, and small cars. The focus is on the performance and dynamic response of the whole system, on the mechanical properties of the subsystems of the vehicle (chassis, tires, suspensions) and on the man-machine interaction including passive response of the rider's body and active rider control. Topics of interest also include engines and electric motors for light vehicles, passive and mechatronic systems for the improvement of safety, and vibration energy harvesting devices.

Organizer:	**Alberto Doria**: alberto.doria@unipd.it University of Padova, Italy
Co-Organizer:	**Luis Munoz:** lui-muno@uniandes.edu.co Universidad de los Andes, Colombia

Symposium 7: Advances in Off-road, Agriculture, Military and Commercial Ground Vehicle Design and Testing
Topics include modeling and simulation, verification and validation using physical testing and/or virtual representations. Design, analysis and control methods for system/subsystem/components of commercial and military ground vehicles, which includes but are not limited to multi-body dynamics, terramechanics, vehicle performance evaluation metrics development, on- and off-road mobility and stability, convoy mobility for single- and multi-unit military or commercial vehicles, vehicle survivability in severe environments, occupant and payload safety (from blast and projectile armaments) during military events, etc. The vehicles may include logistical vehicles, military vehicles, heavy-duty for commercial/agricultural applications, all-terrain wheeled, tracked and unmanned ground vehicles. Progress and research in verification and validation studies of vehicle and sensor models and their virtual representation for unmanned and autonomous ground vehicle systems in on- and off-road environments are also encouraged.

Organizer:	**Ole Balling**: oba@eng.au.dk Aarhus University, Denmark
Co-Organizer:	**Peijun Xu:** pxu@ebcoinc.com Ebco Inc.

Symposium 8: Advances in Intelligent Vehicles

This symposium relates to state-of-the-art research and future trends for connected and autonomous vehicles. The topics include, but are not limited to: design of autonomous vehicles including advanced actuators and sensors; communications and networking (V2V, V2I, V2X) for connected vehicles; wireless technologies for connected vehicles; networked information processing, decision-making, and intelligent control; safe driving and accident avoidance; intelligent transportation, vehicle traffic modeling, decentralized congestion control, highway automation and platooning; cooperative driving and traffic management; vision and image processing; vehicle environment perception; pattern recognition for vehicles; automatic navigating control; driver behavior analysis and autonomous cooperative driving

Organizer:	**Liangyao Yu:** yly@tsinghua.edu.cn Tsinghua University, China
Co-Organizer:	**Guangqiang Wu**: wuguangqiang@tongji.edu.cn Tongji University Shanghai, China

A **Best Paper Award** and a **Student Best Paper Award** (for papers authored and submitted by student as the primary author) will be awarded for conference papers that best exemplify the research advances in ground vehicle engineering based on technical reviews and evaluations of symposium organizers. Each Best Paper Award consists of a **$500 cash prize** per paper subject to availability of funds. Best paper Finalists are encouraged to submit an enhanced version to the ASME Journal of Mechanical Design.

The Vehicle Design Committee will continue the **William Milliken Lecture Award** at the 2022 AVT Conference. A separate **Keynote** lecture and **Panel Session** are also planned