

MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 416: Ground Vehicle Dynamics and Design (4) Elective

Course Description: (2019-20 Catalog)	Design of ground vehicles for directional stability and control. Tire mechanics and their effects on vehicle performance. Simulation of vehicle dynamics using digital computer. Synthesis of steering mechanism and suspension system. 3 lectures, 1 laboratory.
Prerequisite Courses:	ME 318, ME 328
Prerequisites by Topic:	1. Mechanical Vibrations 2. Introduction to Design
Textbook: (and/or other required material)	None
References:	<u>Fundamentals of Vehicle Dynamics</u> , Thomas D. Gillespie, SAE Publications, 1992 <u>Race Car Vehicle Dynamics</u> , Milliken and Milliken, SAE Publications, 1995 <u>Theory of Ground Vehicles</u> , J. Y. Wong, John Wiley and Sons, 1978 <u>Tires, Suspension and Handling</u> , John C. Dixon, SAE Publications, 1996 <u>Aerodynamics of Road Vehicles</u> , W.H. Hucho, SAE Publications Published Notes, M. Iannce
Course Coordinator/Instructor:	John Fabijanic, Lecturer, Mechanical Engineering
Course Learning Outcomes:	The student will be able to: 1. Identify the parameters governing ground vehicle static and dynamic cornering and straight-line stability. 2. Understand the mechanisms governing tire behavior and their influence on the dynamics of ground vehicles. 3. Apply analytical and computational tools in the synthesis and evaluation of automotive ground vehicle dynamics and performance.
Relationship of Course to Mechanical Engineering Student Outcomes:	SO 1: Mastered (M) SO 2: SO 3: Mastered (M) SO 4: SO 5: Mastered (M) SO 6:

SO 7: Mastered (M)

Topics Covered:

1. Review of the relationship of dynamics and vibrations to vehicle ride properties.
2. Mechanics of pneumatic tires.
3. Fundamentals of turning and steering performance and stability.
4. Handling characteristics and lateral stability of road vehicles.
5. Performance characteristics of ground vehicles including braking stability.
6. Power transmission and performance for ground vehicles.

Laboratory Projects:

1. Tire properties.
2. Kinematics of ground vehicle suspension.
3. Load transfer and dynamic wheel loads.
4. Steady state turning and steering system design.
5. Powertrain design and vehicle performance.
6. Rigid body frequency analysis.
7. Braking and stability.

Quarter long group research/analysis project on current technology and applications applying to ground vehicle dynamics, performance and applications. Topics selected by student groups. Deliverables include annotated presentation and oral presentation.

Class/Lab Schedule:

Three 50-minute lectures per week, one 170-minute lab per week

Contribution of Course to Meeting the Professional Component:

- (a) College-level mathematics and basic sciences:
- (b) Engineering Topics (Science and/or Design): 4 Units or 100%
- (c) General Education:
- (d) Other:

Prepared by: J. Fabijanic

Date: 10/21/19
