

MECHANICAL ENGINEERING PROGRAM
ABET COURSE SYLLABUS

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

Course Description: (2013-15 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:
Fundamentals of Vehicle Dynamics, Thomas D. Gillespie, SAE Publications, 1992
Race Car Vehicle Dynamics, Milliken and Milliken, SAE Publications, 1995
Theory of Ground Vehicles, J. Y. Wong, John Wiley and Sons, 1978
Tires, Suspension and Handling, John C. Dixon, SAE Publications, 1996
Aerodynamics of Road Vehicles, W.H. Hucho, SAE Publications Published Notes, M. Iannace

Course Coordinator/Instructor: John Fabijanac, Professor of ME

Course Learning Outcomes: The student will be able to:
 1. Comprehend the parameters governing ground vehicle static and dynamic cornering and straight-line stability.
 2. Understand mechanisms governing tire behavior and their influence on the dynamics of ground vehicles.
 3. Model and analyze automotive ground vehicles.
 4. Apply analytical and computational tools to aid in the synthesis and evaluation of automotive ground vehicle dynamics and performance.

Relationship of Course to MECHANICAL ENGINEERING Program Outcomes:												
<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	<i>k</i>	<i>l</i>	<i>m</i>
H	L	L	L	H	L	H	L	H	L	H	H	L

Topics Covered:

1. Review of dynamics and vibrations relationship to vehicle ride properties.
2. Mechanics of pneumatic tires.
3. Ackerman steering for low g turns.
4. Handling characteristics and lateral stability of road vehicles.
5. Performance characteristics of ground vehicles including brake design
6. Power transmission for ground vehicles.

Laboratory Projects:

1. Tire properties.
2. Kinematics of ground vehicle suspension.
3. Weight 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: 09/16/13
