

**United States Naval Academy  
Mechanical Engineering Department**

**Catalog Description:** EM486B Vehicle Dynamics**Credit:** 3 (2-2-3)**Designation:** Elective, Mechanical Engineering

The fundamentals of passenger vehicle and light truck design and vehicle dynamics are covered. The engineering principles associated with acceleration, braking, handling, ride quality, aerodynamics and tire mechanics are discussed, as well as suspension and steering design. There will also be several lab exercises where vehicle systems are evaluate by students.

**Prerequisites:** 1/c Engineering major or approval of department chair**Corequisites:** None**Textbooks:** None, online course notes**Course Director:** Prof. L.J. Hamilton**Course Content:**

No.	Topic or Subtopic	hrs.
1	Clutches	3
2	Transmissions	5
3	Differentials	3
4	Road loads	3
5	Brakes	4
6	Tires	4
7	Steady state cornering	4
8	Steering design	4
9	Suspension design	6
10	Dampers/springs	6
11	Aerodynamics	3

**Assessment Methods:**

		YES	NO
A	Quizzes	X	
B	Homework	X	
C	Exams	X	
D	Laboratory Reports	X	
E	Oral Presentations	X	X
F	Design Reports/Notebooks		X
G	Prototypes/Demonstrations		X
H	Projects		X
I	Other		

**Course Outcomes:**

1. Understand system components related to vehicle performance (not including the engine) such as transmissions, clutches, differentials, brakes, steering and suspension systems, tires and aerodynamic devices.
2. Analyze factors affecting vehicle design (e.g. tire data, vehicle mass and road loads).
3. Identify various design parameters and their effect on vehicle dynamics performance (e.g. steering and suspension design, aerodynamics).
4. Understand factors leading to understeer or oversteer characteristics.
5. Be able to perform basic steps involved in hydraulic brake design.
6. Understand need for dampers and basic tuning procedures.
7. Calculate lateral and longitudinal performance given basic vehicle dynamic properties.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Program Outcomes</b>							
(a)	X	X	X	X	X	X	X
(b)	X	X	X	X	X	X	X
(c)			X		X		
(d)							
(e)	X	X	X	X	X	X	X
(f)			X		X		
(g)							
(h)							
(i)							
(j)							
(k)		X	X		X	X	X

**Date of Latest Revision:** 29 OCT 2017, Prof. L.J. Hamilton