

COURSE SYLLABUS

Road Vehicle Dynamics

UP.02.DAP.1.O.21.11-AI

1. Program information

1.1	Higher education institution	University of Pitesti
1.2	Faculty	Mechanics and Technology
1.3	Department	Automobiles and Transport
1.4	Field of studies	Automotive Engineering
1.5	Level of education	Master
1.6	Program / Qualification	Automotive Engineering for Sustainable Mobility

2. Discipline information

2.1	Name of discipline					Road Vehicle Dynamics					
2.2	Instructor of the lecture activities					TABACU Ștefan					
2.3	Instructor of the lab activities					NEAGU Elena					
2.4	Year of the studies	I	2.5	Semester	I	2.6	Type of evaluation	E	2.7	The discipline regime	O

3. Estimated total time

3.1	Number of hours per week	3	3.2	lecture	2	3.3	lab	1
3.4	Total hours of the Coursesyllabus	42	3.5	lecture	28	3.6	lab	14
Distribution of the time allocated to the individual study								ore
Study by handbook, course support, bibliography and notes								30
Additional documentation in the library, on specialized electronic platforms and in the field								30
Preparation of seminars / laboratories, topics, reports, portfolios, essays								40
Tutorial								4
Examinations								4
Other activities								
3.7	Total hours of individual study			108				
3.8	Total hours per semester²			150				
3.9	Number of credits allocated to the discipline			6				

4. Prerequisites (where applicable)

4.1	Curriculum	Not applicable
4.2	Skills	Mathematics, Mechanics, Internal Combustion Engines

5. Conditions (where applicable)

5.1	for the lecture	Classroom equipped with board, video projector, projection screen, computer
5.2	for the lab	Board, computer, lab equipments

6. Specific skills acquired

Professional skills	Application of the principles and methods of the exact sciences and of nature in the construction of physical-mathematical models for simulating the functioning of vehicles. Use of appropriate criteria and methods to identify the correspondence of concepts, theories, and models in the field of automotive engineering with the real systems to which they refer. Developing professional projects by the consistent use of theories and methods specific to road vehicles.
transversal skills	Execution of professional tasks according to the specified requirements and within the required deadlines, following a predetermined work plan and under qualified guidance. Easy integration within a group, assuming specific roles and achieving good communication in the group. Achieving personal and professional skills and efficient use of their own resources and modern study tools.

7. Course goal(s)

7.1 The main goal of the discipline	The general objective of the discipline is to improve the knowledge in the field of vehicle dynamics.
7.2 Specific goal(s)	Describe, explain and calculate the forces acting between the tire and the road during the operation of a vehicle; Identify and verify vehicle function requirements for maneuvers that mainly are either of longitudinal, lateral, and vertical. Describe design and basic function of the vehicle systems: propulsion, brake, and steering.

8. Contents

8.1. Lecture		No. hours	Teaching methods	Remarks Resources used
1	Introduction. Short history. Vehicle dynamics.	2	- Lecture - Exposure with support material - Explication - Description and exemplification - The heuristic conversation - Debate - State the problem - Exercise	board, sketches, tables, graphs, sheets, photos, models, video projector, computer, internet
2	Tires. Tire construction. Tire Size and Load Rating. Terminology and Axis System.	2		
3	Mechanics of force generation. Tractive properties. Cornering properties. Camber thrust. Aligning moment. Combined braking and cornering. Conicity and ply steer. Durability forces. Tire vibrations.	8		
4	Road loads. Mechanics of Air Flow Around a Vehicle. Pressure Distribution on a Vehicle. Aerodynamic Forces. Drag Components. Drag Coefficient. Drag. Crosswind Sensitivity. Rolling resistance. Factors Affecting Rolling Resistance. Typical Coefficients.	6		

	Total road loads. Fuel Economy Effects.			
5	Dynamic axle loads. Static loads on level ground. Low-speed acceleration. Loads on grades.	2		
6	Power-limited acceleration. Engines. Power Train. Traction-limited acceleration. Traction Limits.	4		
7	Braking performance. Stopping distance. Time to stop. Deceleration with wind resistance. Braking forces.	4		
	TOTAL HOURS	28		

8.2. Lab		No. hours	Teaching methods	Remarks Resources used
1	Principles of vehicle layout.	2	<ul style="list-style-type: none"> - Lecture - Exposure with support material - Explication - Description and exemplification - The heuristic conversation - Debate - State the problem - Exercise 	board, sketches, tables, graphs, photos, models, computer, internet, lab equipment for the investigation of tire behavior under static loads; lab equipment for the evaluation of friction coefficient.
2	Tire construction.	2		
3	Tire behavior under static loads.	2		
4	Investigation of the contact patch between the tire and the road.	2		
5	Investigations on the friction coefficient between the tire and the road.	2		
6	Vehicle function requirements for maneuvers that mainly are either of longitudinal, lateral, and vertical	4		
TOTAL ORE		14		

Minimal bibliography:

1. Tabacu, S, lecture notes;
2. Tabacu, S, Tabacu, I., Macarie, T., Neagu E, Dinamica autovehiculelor, Editura Universității din Pitești, 2004;
3. Ghiulai, C., Vasiliu Ch, Dinamica autovehiculelor, Editura Didactică și Pedagogică București, 1975;
4. Milliken, W., Milliken, D, Race car vehicle dynamics, SAE Inc, 1995;
5. Hans Pacejka, Tire and Vehicle Dynamics, Elsevier, 2012;
6. Wong, J., Y., Theory of ground vehicles, John Wiley & Sons, 1978;
7. Thomas D Gillespie, "Fundamentals of Vehicle dynamics", SAE USA 1992;
8. Happian-Smith, J., An Introduction to the Modern Vehicle Design, SAE International, 2002

9. Corroboration the contents of the discipline with the expectations of the epistemic community representatives, professional associations and employers in the field related to the program

The skills acquired in this discipline allow the graduates to work in the field of automotive engineering: design, calibration, test, homologation of thermal engines and automobiles. Being a specialized discipline, its purpose is to training students, especially for engineering centers (design, research, development).

10. Evaluation

Activity type	10.1 Evaluation Criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	Final evaluation	Written and oral exam	50%
10.5 Seminar	Involvement in activity throughout the semester	Questions / answers. Individual discussions	20%
10.6. Work for home	Correct resolution. Quality of presentation	Oral presentation. Individual discussions	30%
10.6 Minimum standard of performance	<ul style="list-style-type: none"> - Definition of the vehicle layout - Longitudinal, lateral, and vertical behavior of the vehicle under static and dynamic loads 		

Date (of filling)
25.09.2019

Instructor (lecture)
Prof.PhD.Eng. **Ștefan TABACU**

Instructor (lab)
Assoc prof.phd.eng. **Elena NEAGU**

Date (of approval)
25.09.2019

Head of department
Prof.PhD.Eng. **Adrian CLENCI**

Head of department (DAT)
Prof.PhD.Eng. **Adrian CLENCI**