

## SYLLABUS

### 1. Data about the program of study

1.1	Institution	<b>The Technical University of Cluj-Napoca</b>
1.2	Faculty	<b>Faculty of Mechanical Engineering</b>
1.3	Department	<b>Automotive Engineering and Transportation</b>
1.4	Field of study	<b>Automotive engineering</b>
1.5	Cycle of study	<b>Bachelor of Science</b>
1.6	Program of study/Qualification	<b>Advanced Techniques in Automotive Engineering</b>
1.7	Form of education	<b>Full time</b>
1.8	Subject code	<b>10.00</b>

### 2. Data about the subject

2.1	Subject name	Vehicle Dynamics			
2.2	Subject area	Automotive engineering			
2.2	Course responsible/lecturer	PhD. Lecturer Nicolae Cordos			
2.3	Teachers in charge of seminars	PhD. Lecturer Nicolae Cordos			
2.4 Year of study	<b>1</b>	2.5 Semester	<b>2</b>	2.6 Assessment	<b>C</b>
2.7 Subject category	Formative category			<b>DA</b>	
	Optionality			<b>DI</b>	

### 3. Estimated total time

3.1 Number of hours per week	<b>3</b>	of which	3.2 Course	<b>1</b>	3.3 Seminar		3.3 Laborator	<b>1</b>	3.3 Proiect	<b>1</b>
3.4 Total hours in the curriculum	<b>42</b>	of which	3.5 Course	<b>14</b>	3.6 Seminar		3.6 Laborator	<b>14</b>	3.6 Proiect	<b>14</b>
3.7 Individual study:										
(a) Manual, lecture material and notes, bibliography										42
(b) Supplementary study in the library, online and in the field										20
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										17
(d) Tutoring										1
(e) Exams and tests										3
(f) Other activities										-
3.8 Total hours of individual study (summ (3.7(a)...3.7(f)))										<b>83</b>
3.9 Total hours per semester (3.4+3.8)										<b>125</b>
3.10 Number of credit points										<b>5</b>

### 4. Pre-requisites (where appropriate)

4.1	Curriculum	General knowledge of mathematics, physics, mechanics
4.2	Competence	Computer use knowledge

### 5. Requirements (where appropriate)

5.1	For the course	- classroom with blackboard, on line Teams
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5.2	For the applications seminarului / laboratorului / proiectului	Attendance (present 100%) and performing (completion / promotion) the applications activities ,condition the admission to the final evaluation of the discipline.
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## 6. Specific competences

Professional competences	<ul style="list-style-type: none"> <li>• Identification, definition and using of the specific concepts for the vehicle dynamics;</li> <li>• Using the study principles and the graphical tools for describing the dynamic behavior of motor vehicles;</li> <li>• Description of the dynamic phenomena specific to a rational exploitation of the motor vehicles</li> <li>• Develop of the models from the field of engineering automotive;</li> <li>• Development of technical solutions and study methodologies in the field of engineering automotive;</li> </ul> <p>Implementation of the study strategies of the vehicle dynamics depending on their exploitation conditions.</p>
Cross competences	<ul style="list-style-type: none"> <li>• Responsibly execution of the complex professional duties in conditions of restricted autonomy and qualified assistance - <i>Autonomy and responsibility</i></li> </ul> <p>Awareness of the need for continuous training; efficient use of the resources and the learning techniques for personal and professional development - <i>Personal and professional development</i></p>

## 7. Discipline objectives (as results from the *key competences gained*)

7.1	General objective	Development of professional skills in the field of automotive engineering
7.2	Specific objectives	<ul style="list-style-type: none"> <li>• knowledge, understanding concepts, theories and methods of modeling of the dynamics motor vehicles; Their proper use in the professional communication</li> <li>• Use the basic knowledge for the application and interpretation of various types of concepts, situations, processes etc. (In wider contexts) associated to the vehicle dynamics - Explanation and Interpretation</li> </ul> <p>Development of professional projects using innovative principles and methods, quantitative and qualitative, consecrated in the field of the motor vehicle engineering - Creativity and Innovation</p>

## 8. Contents

8.1. Lecture (syllabus)	Number of hours	Teaching methods	Notes
1.The fundamentals vehicle dynamics. Concepts of modeling in Matlab / Simulink.	2	Exposure (explanation, description), presentation, analysis, advantages, disadvantages, applicability,	Visual technical equipment
2.The wheels with tires for the motor vehicles (static and dynamic wheel loaded) .	2		
3. The vehicles suspensions. System modelling Driveline Dynamics. The Gear Ratio	2		
4.Resistance to the movement of the motor vehicles	2		
5.The dynamic loads of the motor vehicle	2		

6.The modelling of the vehicles starter ability. The modelling of the vehicles braking ability.	2	conversation, demonstration,	
7.The vehicle stability	2	illustration, guidance etc	
<b>Bibliography</b>			
<p>1]. Abe, M., Vehicle Handling Dynamics, Theory and Application. Oxford, Butterworth-Heinemann, Published by Elsevier Ltd., 2009.</p> <p>[2] Spletstoesr, Jonah M. Developing a Simulation Tool for Vehicle Dynamics and Rollover of the Baja Buggy and Formula Hybrid Car. Milwaukee School of Engineering, Fachhochschule Luebeck, 2010. Diplomarbeit.</p> <p>[3] Haugg, Armin. Analysis and Simulation of the Dynamic Steering Response for an SAE Baja-Car. Milwaukee School of Engineering, Fachhochschule Luebeck, 2008. Diplomarbeit.</p> <p>[5]. Todorut, A., Bazele dinamicii autovehiculelor. Algoritmi de calcul, teste, aplicatii. Cluj-Napoca, Edit. Sincron, 2005.</p> <p>[6]. Automotive System Dynamics, Yu Fan and Lin Yi, China Machine Press, 2005.</p> <p>[7]. Vehicle System Dynamics and Control, Yu Fan, China Machine Press, 2010.</p> <p>[8]. Automotive System Dynamics and Control, Masato Abe, Yu Fan, China Machine Press, 2012.</p>			
8.2. Seminars /Laboratory/Project	Number of hours	Teaching methods	Notes
Simulation of the vehicle wheels	2	Problem solving, exercise, algorithmic, conversation, explanation, description, demonstration, illustration, guidance etc.	visual technical equipment, computer software of analysing the dynamics of motor vehicles
Simulation of the vehicle suspension system	2		
Design and simulation of the drivetrain	2		
The simulation of the vehicles starter ability	2		
The simulation of the vehicles braking ability.	2		
The simulation of the vehicle stability	2		
The simulation of the vehicle advancing resistance	2		
<b>Bibliography</b>			
<p>[1]Abe, M., Vehicle Handling Dynamics, Theory and Application. Oxford, Butterworth-Heinemann, Published by Elsevier Ltd., 2009.</p> <p>[2] Spletstoesr, Jonah M. Developing a Simulation Tool for Vehicle Dynamics and Rollover of the Baja Buggy and Formula Hybrid Car. Milwaukee School of Engineering, Fachhochschule Luebeck, 2010. Diplomarbeit.</p> <p>[3] Haugg, Armin. Analysis and Simulation of the Dynamic Steering Response for an SAE Baja-Car. Milwaukee School of Engineering, Fachhochschule Luebeck, 2008. Diplomarbeit.</p> <p>[5]. Todorut, A., Bazele dinamicii autovehiculelor. Algoritmi de calcul, teste, aplicatii. Cluj-Napoca, Edit. Sincron, 2005.</p> <p>[6]. Automotive System Dynamics, Yu Fan and Lin Yi, China Machine Press, 2005.</p> <p>[7]. Vehicle System Dynamics and Control, Yu Fan, China Machine Press, 2010.</p> <p>[8]. Automotive System Dynamics and Control, Masato Abe, Yu Fan, China Machine Press, 2012.</p>			

**9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field**

The gained skills will be required to the employees who work in the field of the motor vehicle engineering. In the training of the competences are taking into account the employers options recommended for the higher education institutions for training the graduates (ability to use the time efficiently, empowering team work, ability to learn quickly, the ability to coordinate teams, new opportunities in the field the interest of the company, ability to use the computer simulation, ability to adapt to new situations, etc.) and the priorities recommended by the employers in the field for training the graduates (creativity and capacity for innovation, ability to negotiate, critical and self-critical analysis ability, knowledge of other areas).

## 10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	Frequency and behavior in activities. The given marks to the final examination	written assessment	50%
10.5 Seminars /Laboratory/Project	- Ability to work with assimilated knowledge; - Ability to apply in practice;	Active participation at applications and project	50%
10.6 Minimum standard of performance			
- calculation and graphical representation of some components of the vehicles, at performance level; - elaboration of physical-mathematical models in order to use them in the study of vehicle dynamics;			

Date of filling in:		Title Surname Name	Signature
12.10.2020	Lecturer	Lecturer Dr. Eng. Nicolae Cordos	
	Teachers in charge of application	Lecturer Dr. Eng. Nicolae Cordos	

Date of approval in the department .....	Head of department Prof. Dr. Eng. BARABÁS István
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Date of approval in the faculty .....	Dean Prof.dr.ing. Nicolae Filip
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