SYLLABUS

1. Data about the program of study

1.1	Institution	Technical University of Cluj-Napoca
1.2	Faculty	Faculty of Automotive Engineering, Mechatronics and Mechanics
1.3	Department	Automotive Engineering and Transportation
1.4	Field of study	Automotive Engineering
1.5	Cycle of study	Master in Science
1.6	Program of study/Qualification	Advanced Techniques in Automotive Engineering
1.7	Form of education	Full time
1.8	Subject code	10.00

2. Data about the subject

2.1	Subject name			Vehicle Dynamics			
2.2	Subject area			Automotive engineering			
2.3	Course responsible/lecturer			Associate Professor PhD Eng. Nicolae CORDOS - nicolae.cordos@auto.utcluj.ro			
2.4	Teachers in charge of seminars			Associate Professor PhD Eng. Nicolae CORDOS- nicolae.cordos@auto.utcluj.ro			
2.5 Year of study	I	2.6 Semester	II	2.7 Assessment	C	2.8 Subject category	DA/DI

3. Estimated total time

3.1 Number of hours per week	3	3.2 of which, course:	1	3.3 seminar / **laboratory / project**	0/1/1
3.4 Total hours in the curriculum	42	3.5 of which, course:	14	3.6 seminar / **laboratory / project**:	28

Individual study	hours
Manual, lecture material and notes, bibliography	45
Supplementary study in the library, online and in the field	20
Preparation for seminars/laboratory works, homework, reports, portfolios, essays	11
Tutoring	5
Exams and tests	2
Other activities	-

3.7	Total hours of individual study	83
3.8	Total hours per semester	125
3.9	Number of credit points	5

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	Course room, laptop, video projector
5.2	For the applications	Attendance (present 100%) and performing (completion / promotion) the applications activities condition the admission to the final evaluation of the discipline.

6. Specific competences

Professional competences	• Identification, definition and using of the specific concepts for the vehicle dynamics; • Using the study principles and the graphical tools for describing the dynamic behavior of motor vehicles; • Description of the dynamic phenomena specific to a rational exploitation of the motor vehicles • Develop of the models from the field of engineering automotive; • Development of technical solutions and study methodologies in the field of engineering automotive; • Implementation of the study strategies of the vehicle dynamics depending on their exploitation conditions.
Cross competences	• Responsibly execution of the complex professional duties in conditions of restricted autonomy and qualified assistance - *Autonomy and responsibility* • Awareness of the need for continuous training; efficient use of the resources and the learning techniques for personal and professional development - *Personal and professional development*

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	• knowledge, understanding concepts, theories and methods of modeling of the dynamics motor vehicles; Their proper use in the professional communication • 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 • Development of professional projects using innovative principles and methods, quantitative and qualitative, consecrated in the field of the motor vehicle engineering - Creativity and Innovation

8. Contents

8.1. Lecture (syllabus)		Teaching methods	Notes
1.	The fundamentals vehicle dynamics. Concepts of modeling in Matlab / Simulink. Modeling Elements of the dynamic systems	Exposure (explanation, description), presentation, analysis, advantages, disadvantages, applicability, conversation, demonstration, illustration, guidance etc.	2 hours
2.	The wheels with tires for the motor vehicles. The vehicles suspensions. System modelling		2 hours
3.	Modeling the drivetrain of the vehicle. The modeling of the vehicle in motion (characteristic of the engine speed, the power transmitted to the driving wheels; the gear ratio of the main transmission; reports of gearbox transmission, moments at the driving wheels, power to the driving wheels ; the grip of the vehicle wheels to the road)		2 hours
4.	The modeling of the longitudinal vehicle dynamics. Modelling the dynamic loads of the motor vehicle		2 hours
5.	The modelling of the vehicles starter ability. The modelling of the vehicles braking ability.		2 hours
6.	The modelling of the vehicle maneuverability. The modeling of the vehicle stability		2 hours
7.	The modeling of the vehicle advancing resistance		2 hours

Bibliography

[1]. Abe, M., Vehicle Handling Dynamics, Theory and Application. Oxford, Butterworth-Heinemann, Published by Elsevier Ltd., 2009.
[2] Splettstoessr, 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.
[3] Haugg, Armin. Analysis and Simulation of the Dynamic Steering Response for an SAE Baja-Car.

[4] Milwaukee School of Engineering, Fachhochschule Luebeck, 2008. Diplomarbeit.
[5]. Todorut, A., Bazele dinamicii autovehiculelor. Algoritmi de calcul, teste, aplicatii. Cluj-Napoca, Edit. Sincron, 2005.
[6]. Automotive System Dynamics, Yu Fan and Lin Yi, China Machine Press, 2005.
[7]. Vehicle System Dynamics and Control, Yu Fan, China Machine Press, 2010.
[8]. Automotive System Dynamics and Control, Masato Abe, Yu Fan, China Machine Press, 2012.

8.2. Applications/Seminars		Teaching methods	Notes
1.	Simulation of the vehicle wheels	Problem solving, exercise, algorithmic, conversation, explanation, description, demonstration, illustration, guidance etc.	2 hours
2.	Simulation of the vehicle suspension system		2 hours
3.	Design and simulation of the drivetrain		2 hours
4.	The simulation of the vehicles starter ability		2 hours
5.	The simulation of the vehicles braking ability.		2 hours
6.	The simulation of the vehicle stability		2 hours
7.	The simulation of the vehicle advancing resistance		2 hours

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1]. Abe, M., Vehicle Handling Dynamics, Theory and Application. Oxford, Butterworth-Heinemann, Published by Elsevier Ltd., 2009.
[2] Splettstoessr, 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.
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8.3. Project		
1. Definition of functions based on the main parameters of the vehicle studied	Problem solving, exercise, algorithmic, conversation, explanation, description, demonstration, illustration, guidance etc.	2 hours
2. Evaluating the forces and torques occurring on the wheels		2 hours
3. Identifying the driving conditions of the vehicle		2 hours
4. Determining the dynamic performance of the vehicle		2 hours
5. Determination of the resistance of the vehicle		2 hours
6. Determination of longitudinal stability parameters		2 hours
7. Evaluation of the activity during the project hours		2 hours

Bibliography

[1]. Abe, M., Vehicle Handling Dynamics, Theory and Application. Oxford, Butterworth-Heinemann, Published by Elsevier Ltd., 2009.
[2] Splettstoessr, 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.
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[5]. Todorut, A., Bazele dinamicii autovehiculelor. Algoritmi de calcul, teste, aplicatii. Cluj-Napoca, Edit. Sincron, 2005.
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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
Course	Frequency and behaviour in activities. The given marks to the final examination	Written assessment	50%
Applications	- Ability to work with assimilated knowledge; - Ability to apply in practice;	Active participation at applications.	30%
Project	- Ability to work with assimilated knowledge; - Ability to apply in practice;	Active participation at Project activities.	20%
10.4 Minimum standard of performance			
- calculation and graphic representation of some vehicle components at the performance level; - elaboration of physical-mathematical models for their use in the study of motor vehicle dynamics; - Presentation of the project correctly and completely - Qualified - each subject in the test has to be solved - minimum score 5 (five)			

Data completării: 23.06.2025	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
	Curs	Associate Professor PhD Eng. Nicolae Cordos	
	Aplicații	Associate Professor PhD Eng. Nicolae Cordos	

Data avizării în Consiliul Departamentului ART

__24.06.2025_____

Director Departament
Prof.dr.ing. Barabás István

Data aprobării în Consiliul Facultății ARMM
25.06.2025

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Decan
Prof.dr.ing. Filip Nicolae