

# SYLLABUS<sup>1</sup>

## 1. Information about the program

1.1 Higher education institution	Politehnica University of Timisoara
1.2 Faculty <sup>2</sup> / Department <sup>3</sup>	Faculty of Mechanical Engineering/ Department of Mechanical Machines, Equipments and Transportation
1.3 Chair	—
1.4 Field of study (name/code <sup>4</sup> )	Mechanical Engineering/20.70.10
1.5 Study cycle	Master
1.6 Study program (name/code/qualification)	Railway Modern Systems/M436.15.01.CA2 / Master

## 2. Information about the discipline

2.1 Name of discipline	Advanced Elements of Railway Vehicles Dynamics						
2.2 Coordinator (holder) of course activities	Assoc.prof.dr.eng. Eugen Ghita						
2.3 Coordinator (holder) of applied activities <sup>5</sup>	Assoc.prof.dr.eng. Eugen Ghita						
2.4 Year of study <sup>6</sup>	1	2.5 Semester	1	2.6 Type of evaluation	E	2.7 Type of discipline	DCA

## 3. Total estimated time (hours / semester of didactic activities)

3.1 No. of hrs. / week	4 , of which:	3.2 course	2	3.3 seminar/laboratory/ project/training	2
3.4 Total no. of hrs. in the education curricula	56 , of which:	3.5 course	28	3.6 applied activities	28
3.7 Distribution of time for individual activities related to the discipline					hrs.
Study using a manual, course materials, bibliography and lecture notes					40
Additional documentation in the library, on specialized electronic platforms and on the field					25
Preparation for seminars / laboratories, homeworks, assignments, portfolios, and essays					30
Tutoring					15
Examinations					15
Other activities					
<b>Total hrs. of individual activities</b>					<b>125</b>
3.8 Total hrs. / semester <sup>7</sup>	181				
3.9 No. of credits	9				

## 4. Prerequisites (where applicable)

4.1 Curriculum	<ul style="list-style-type: none"> <li>Mechanics, strength of materials, geometry, mathematical analysis</li> </ul>
4.2 Competencies	<ul style="list-style-type: none"> <li></li> </ul>

## 5. Conditions (where applicable)

5.1 of the course	<ul style="list-style-type: none"> <li></li> </ul>
5.2 to conduct practical activities	<ul style="list-style-type: none"> <li></li> </ul>

## 6. Specific competencies acquired

<sup>1</sup> The form corresponds to the Syllabus promoted by OMECTS 5703/18.12.2011 (Annex3).

<sup>2</sup> The name of the faculty which manages the educational curriculum to which the discipline belongs.

<sup>3</sup> The name of the department entrusted with the discipline, and to which the course coordinator / holder belongs.

<sup>4</sup> Fill in the code provided in GD no. 493/17.07.2013.

<sup>5</sup> The applied activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).

<sup>6</sup> The year of study to which the discipline is provided in the curriculum.

<sup>7</sup> It is obtained by summing up the number of hrs. from 3.4 and 3.7.

Professional competencies <sup>8</sup>	<ul style="list-style-type: none"> <li>• Knowledge and analysis of the dynamic phenomenon in order to satisfy the circulation under safety conditions of the modern railway vehicles</li> </ul>
Transversal competencies	<ul style="list-style-type: none"> <li>•</li> </ul>

### 7. Objectives of the discipline (based on the grid of specific competencies acquired)

7.1 General objective of the discipline	<p>The course is focused on learning notions and precepts on railway vehicle dynamics in order to be able to design and to operate a railway modern system</p> <ul style="list-style-type: none"> <li>•</li> </ul>
7.2 Specific objectives	<ul style="list-style-type: none"> <li>• Wheelset and suspension design, Analysis of the derailment criterions, analysis of the circulation through curved routes, Vibrations of the railway vehicles, Damping systems</li> <li>•</li> </ul>

### 8. Content

8.1 Course	No. of hours	Teaching methods
1.The analysis of the suspension of the railway vehicles - Calculus of springs subjected at compression and torsion - Design of the suspension systems of locomotives - Stiffness and flexibility of bogies	4	Video projector and teaching blackboard
2. The partition of the forces on the wheelset axles and the static equilibrium of the bogies and locomotives - Two and three-axle bogies with connected or independent suspensions - Transmission ratio of the suspension equilibrium bars	4	Video projector and teaching blackboard
3. The railway infrastructure - Railroad parameters - The geometry of the railway infrastructure	4	Video projector and teaching blackboard
4. The circulation of the railway vehicles through the curved	6	Video projector and

<sup>8</sup> The professional competencies and the transversal competencies will be treated according to the Methodology of OMECTS 5703/18.12.2011. The competencies listed in the National Register of Qualifications in Higher Education [Registrul Național al Calificărilor din Învățământul Superior RNCIS] ([http://www.rncis.ro/portal/page?\\_pageid=117,70218&\\_dad=portal&\\_schema=PORTAL](http://www.rncis.ro/portal/page?_pageid=117,70218&_dad=portal&_schema=PORTAL)) will be used for the field of study from 1.4 and the program of study from 1.6 of this form, involving the discipline.

<p>routes</p> <ul style="list-style-type: none"> <li>- The wheel-rail contact</li> <li>- The main positions of the railway vehicle through the curved routes. Geometrical analysis</li> <li>- The estimation of the pole position of the bogie and of the wheel-rail attack angle</li> <li>- The dynamics of the railway vehicles through the curved routes. The equilibrium of forces and torques</li> <li>- The criterions of safety against the derailment</li> <li>- The wear of the wheel-rail contact surface</li> </ul>		teaching blackboard
<p>5. The vibrations of the railway vehicles under running conditions</p> <ul style="list-style-type: none"> <li>- Calculus of the free and coupled vibrations</li> <li>-The appreciation of the quality of the running process according to the comfort criterions</li> <li>- The vibration damping systems of the railway vehicles</li> </ul>	6	Video projector and teaching blackboard
<p>6. Shock absorbers</p> <ul style="list-style-type: none"> <li>- Hydraulic and dry friction shock absorbers design</li> <li>- The static and dynamic analysis of the main positions of the piston</li> </ul>	4	Video projector and teaching blackboard
<p>Bibliography<sup>9</sup></p> <p>1.E.Ghita-„Strength at wheel-rail contact”,Mirton Publishing House,Timişoara,1998</p> <p>2.E.Ghita,Gh.Turos-„Dynamics of railway vehicles”, „POLITEHNICA” Publishing House, Timişoara, 2006</p> <p>3.W.Schielen-„Vehicle and guideway modelling suspension system”,Dynamical Analysis of Vehicle Systems-Theoretical Foundations and Advanced Applications”,Centre International for Mechanical Studies,Udine,Italia,2006</p> <p>4.P.Lugner-„Propulsion and handling of road vehicles tyre models” ”,Dynamical Analysis of Vehicle Systems-Theoretical Foundations and Advanced Applications”,Centre International for Mechanical Studies,Udine,Italia,2006</p> <p>5.H.True-„Dynamics of railway vehicles:wheel-rail contact” ”,Dynamical Analysis of Vehicle Systems-Theoretical Foundations and Advanced Applications”,Centre International for Mechanical Studies,Udine,Italia,2006</p>		

<sup>9</sup> At least one title must belong to the department staff teaching the discipline, and at least 3 titles must refer to national and international works relevant for the discipline, and which can be found in the Politehnica University Library.

6.S.lwnicki- „Handbook of railway dynamics”, CRC Press, Taylor & Francis Group, Boca Raton, U.S.A.,2006

8.2 Applied activities <sup>10</sup>	No. of hours	Teaching methods
Individual design of a suspension system and of a wheelset axle of a particular rail vehicle	28	Video projector, teaching blackboard, computer calculation
Bibliography <sup>11</sup> 1.E.Ghita-„Strength at wheel-rail contact”, Mirton Publishing House, Timișoara, 1998		
2.E.Ghita, Gh.Turos-„Dynamics of railway vehicles”, „POLITEHNICA” Publishing House, Timișoara, 2006		
3.S.lwnicki- „Handbook of railway dynamics”, CRC Press, Taylor & Francis Group, Boca Raton, U.S.A.,2006		

**9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program**

- Technical knowledge provided by this discipline allows the students to perform analysis and calculation of the particular design of the railway vehicle parts running under real conditions. The curricula of this discipline is similar with others from the following universities:
  - Manchester Metropolitan University, UK, <http://www2.mmu.ac.uk/>,
  - Budapest University of Technology and Economics, Hungary, <https://www.bme.hu/>
  - International Centre for Mechanical Sciences, Udine, Italy <http://www.cism.it/>.

**10. Evaluation**

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Grade- minimum 5 on each subject	Written exam (3 subjects)	66 %
10.5 Applied activities	<b>S:</b>		
	<b>L:</b>		
	<b>P:</b> Grade – minimum 5 on dissertation	Final project dissertation	33 %
	<b>Pr:</b>		
<b>10.6 Minimum performance standard</b> (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified)			
<ul style="list-style-type: none"> <li>• The final grade must be at least 5</li> </ul>			

<sup>10</sup> The types of applied activities are those specified in footnote 5. If the discipline contains several types of applied activities, then these will be written consecutively in the lines of the table below. The type of activity will be written in a distinct line, as „Seminar:”, „Laboratory:”, „Project:” and/or „Practice/Training:”.

<sup>11</sup> At least one title must belong to the staff teaching the discipline.

**Date of completion**

12.12.2015

**Course coordinator  
(signature)**

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**Coordinator of applied activities  
(signature)**

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**Head of Department  
(signature)**

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**Date of approval in the Faculty  
Council<sup>12</sup>**

**Dean  
(signature)**

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<sup>12</sup> Avizarea este precedată de discutarea punctului de vedere al board-ului de care aparține programul de studiu cu privire la fișa disciplinei.