COURSE SYLLABUS
APPLIED MECHANICS
UP.02.DAP.1.O.21.02-AI

1. Program information

1.1	Higher education institution	National University of Science and Tehnology Polytechnic Bucharest, Pitesti University Center
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	**APPLIED MECHANICS**
2.2	Instructor of the lecture activities	Lect. PhD. Eng. Stan Petre
2.3	Instructor of the sem. activities	Lect. PhD. Eng. Stan Petre

2.4	Year of the studies		2.5	Semester		2.6	Type of evaluation	E	2.7	The discipline regime	O, DAP

3. Estimated total time

3.1	Number of hours per week		3	3.2	lecture	2	3.3	sem.	1
3.4	Total hours of the Course syllabus		42	3.5	lecture	28	3.6	sem.	14

Distribution of the time allocated to the individual study	ore
Study by handbook, course support, bibliography and notes	20
Additional documentation in the library, on specialized electronic platforms and in the field	20
Preparation of seminars / laboratories, topics, reports, portfolios, essays	12
Tutorial	-
Examinations	6
Other activities	

3.7	Total hours of individual study	58
3.8	**Total hours per semester[2]**	100
3.9	**Number of credits allocated to the discipline**	4

4. Prerequisites (where applicable)

4.1	Curriculum	Not applicable
4.2	Skills	Mathematics, Mechanics

5. Conditions (where applicable)

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

6. Specific skills acquired

Professional skills	C1 - innovative conception and design with the aim of creating products, technologies that ensure sustainable mobility C2 - numerical modeling and simulation of the various components, sub-assemblies and assemblies of the car, in the context of minimizing the number of physical prototypes C4 - experimental research with the aim of validating prototypes resulting from conception, design, modeling and numerical simulation activities C5 - documenting and exploiting the information C6 - professional communication
transversal skills	CT2 - the responsible execution of professional tasks under conditions of autonomy

7. Course goal(s)

7.1 The main goal of the discipline	- providing students with specific work methods and techniques for the design, development and validation of products in the field of automotive engineering (e.g. documentation and professional communication, modeling, simulation, manufacturing, calibration, optimization, project management, etc.); - developing the ideas of autonomy and teamwork, at the level of students, by establishing a pedagogy based on projects, assumed by teams and by individual responsibility; - the development of the skills necessary to carry out fundamental and applied research works, with the aim of creating technologies, products that ensure sustainable (sustainable) mobility; - the training of specialists for the scientific research activity in the field of automobile engineering, in accordance with the national and European framework of qualifications and with the current needs of the relevant industry; - the development of highly qualified human resources for the scientific doctorate activity; - sharing good practices in teaching, learning and research through the development of national and international partnerships.
7.2 Specific goals	The transmission of knowledge and the formation of the skills necessary to acquire the following skills, - innovative conception and design with the aim of creating products, technologies that ensure sustainable (sustainable) mobility, - numerical modeling and simulation of the various components, sub-assemblies and assemblies of the car, in the context of minimizing the number of physical prototypes, - calibration of the various subsystems of the car

for the purpose of energy optimizations, - experimental research with the aim of validating prototypes resulting from conception, design, modeling and numerical simulation activities, - documenting and exploiting the information, - Project Management, - the responsible execution of professional tasks under conditions of autonomy, - carrying out activities exploiting the ideas of teamwork and continuous improvement of one's own activity.

8. Contents

	8.1. Lecture	No. hours	Teaching methods	Remarks Resources used
1	THE ANALYTICAL MECHANICS - THE PRINCIPLE OF D" ALEMBERT - THE PRINCIPLE OF TORICELLI, THE PRINCIPLE OF VIRTUAL POWER	2	*- Lecture* *- Exposure with support material* *- Explication* *- Description and exemplification* *- The heuristic conversation* *- Debate* *- State the problem* *-Exercise* -	*board, tables, graphs, photos, computer*
2	THE ANALYTICAL MECHANICS LAGRANGE'S EQUATIONS OF THE FIRST SPEECH.	2		
3	THE ANALYTICAL MECHANICS - THE EQUATIONS OF LAGRANGE OF THE SECOND SPEECH.	2		
4	THE ANALYTICAL MECHANICS -HAMILTON'S FUNCTION -HAMILTON'S EQUATIONS. THE HAMILTON EQUATIONS FOR SYSTEMS OF ARTICULAR BARS	2		
5	THE ANALYTICAL MECHANICS - VARIATION PRINCIPLES. - EULER'S EQUATIONS - VARIATION PRINCIPLE OF HAMILTON, -THE PRINCIPLE OF MAUPERTUIS, -BRAHISTOCRONE CURVE	2		
6	THE ANALYTICAL MECHANICS -STABILITY OF BALANCE -BALANCING EQUATIONS FOR CONSERVATIVE SYSTEMS, -STABILITY OF A BALANCE CONFIGURATION, -LEJEUNE-DIRICHLET THEOREM	2		
7	THE ANALYTICAL MECHANICS STABILITY OF BALANCE THE SMALL OSCILATIONS OF THE SYSTEM UNDER A STABLE BALANCE CONFIGURATION	2		
8	ANALYTICAL MECHANICS STABILITY OF MOVEMENT -STABILITY IN THE FIRST APPROACH, ROUTH-HURWITZ CRITERION - STABILITY OF NON-LINEAR SYSTEMS	2		
9	ANALYTICAL MECHANICS STABILITY OF MOVEMENT -STABILITY IN THE FIRST APPROACH, ROUTH-HURWITZ CRITERION - STABILITY OF NON-LINEAR SYSTEMS	2		
10	DYNAMICS OF MULTI-MOBILE SYSTEMS - THE EQUATIONS OF MOVEMENT - STABILITY OF MOVEMENT	2		
11	THE PARAMETRIC VIBRATIONS	2		
12	THE PARAMETRIC VIBRATIONS -THE MATHIEU EQUATION	2		
13	ELASTIV WAVES ELASTIC WAVES IN A ISOTROPIC MEDIUM SURFACE WAVES	2		
14	ELASTIV WAVES VIBRATION OF RODS AND PLATES ANHARMONIC VIBRATIONS	2		
	TOTAL HOURS	28		

Minimal bibliography:
1. P. Stan, M. Stan, Applied Mathematics in Mechanics, Pitesti University Publishing House, page 412, ISBN 978-606-560-498-8, 2016
2. R. Mircea Morariu, Mechanics, U.T. Press Cluj-Napoca, ISBN 978-606-737-251-9, 2017
3. M. Stan, P. Stan, Fluid Mechanics and Elements of Hydraulics, page 130, Pitesti University Publishing House, ISBN 978-606-560-499-5, 2016,
4. Stănescu, N.-D., Numerical methods, Pitesti, 2022.
5. G. Spinu, F. Capatana, Synthesis of theoretical and applied mechanics, Ed. Matrixrom, 2021
6. Pandrea, N., Stănescu, N.-D., Dynamics of the Rigid Solid with General Constraints by a Multibody Approach, John Wiley & Sons, Chichester, UK, 2016.
7. Pandrea, N., Popa, D., Stănescu, N.-D., Classical and Modern Approaches in the Theory of Mechanisms, John Wiley & Sons, Chichester, UK, 2017.
8. Tabacu Ș., Baba, V., Diaconescu, V., Sandu, A., Numerical analysis of mechanical systems, Pitesti University Publishing House, 2020.

8.2. Lecture		No. hours	Teaching methods	Remarks Resources used
1	APPLICATIONS OF THE VIRTUAL MECHANICAL PRINCIPLE IN THE STUDY OF SUSPENDED BARS	2	*- Explication - Description and exemplification - The heuristic conversation -Exercise*	*board, tables, graphs, photos, computer*
2	APPLICATIONS OF THE PRINCIPLE OF TORICELLI AND THE PRINCIPLE OF VIRTUAL POWERS IN THE STUDY OF SUSPENDED BARS.	2		
3	APPLICATIONS OF LAGRANGE'S EQUATIONS	2		
4	APPLICATIONS OF HAMILTON'S EQUATIONS	2		
5	STABILITY OF BALANCE AND MISCELLANEOUS	2		
6	DIFFERENTIAL EQUATIONS OF MIXING OF BIMOBILE MECHANISMS	2		
7	PARAMETRIC VIBRATIONS	2		
TOTAL HOURS		14		

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1. P. Stan, M. Stan, Applied Mathematics in Mechanics, Pitesti University Publishing House, page 412, ISBN 978-606-560-498-8, 2016
2. R. Mircea Morariu, Mechanics, U.T. Press Cluj-Napoca, ISBN 978-606-737-251-9, 2017.
3. M. Stan, P. Stan, Fluid Mechanics and Hydraulic Elements, page 130, Pitesti University Publishing House, ISBN 978-606-560-499-5, 2016
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8. **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 content of the discipline is an opportunity given to the students to ensure that they will face many challenges in the labor market and its related activities, in accordance with the expectations of the employers. Being a specialized discipline, its purpose is to training students, especially for engineering centers (design, research, development).

9. **Evaluation**

Activity type	10.1 Evaluation Criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.1 Course	Final evaluation	Written exam.	60%
10.2 Seminar	Involvement in activity throughout the semester	Questions / answers. Individual discussions	20%
10.3. Verification test	Correct resolution. Quality of presentation	writeln presentation.	20%
10.4 Minimum standard of performance	Proper use of the mathematical apparatus applied in computational relations Writing and interpreting the equations of motion within the studied applications		

Date (of filling) 28.09.2023	Instructor (lecture) Lect. PhD. Eng. Petre STAN	Instructor (seminar) Lect. PhD. Eng. Petre STAN

Date (of approval) 29.09.2023	Head of department Lect. PhD. Eng. . Helene BĂDĂRĂU ȘUSTER	Head of department (DAT) Lect. PhD. Eng. Helene BĂDĂRĂU ȘUSTER