ACADEMIA ROMÂNĂ - SCOSAAR
DOCTORAL SCHOOL OF ENGINEERING, MECHANICAL, COMPUTER SCIENCES

DISCIPLINE SHEET

Name of discipline: ANALYSIS AND SIMULATION OF MOBILE MECHANICAL SYSTEMS
Holder of course activities: CSI dr. ing. Mihaiela ILIESCU
Year of study: 1

Number of hours per week/Checking/Credits:		
Course	**Form of examination**	**Credits**
Experimental course / module 6 / 9	Examination	15

A. DISCIPLINE OBJECTIVES (Objectives are formulated in terms of professional competences):

General objective of the discipline	• Knowledge of the basic principles of mechanism design.
Specific objectives:	• Realization of kinematic, kinetostatic, dynamic analysis of the mechanism. • Balancing mechanisms. • Modeling and simulation of mechanisms – CAD software. • Experimentation skills, mechanism / mechatronic system testing.

B. CONDITIONS (where applicable)

course development	• computer, projection system, software: SolidWorks, Catia, MatLAb, SimuLink • Mechanical prototype, mechatronic systems

C. SPECIFIC COMPETENCES ACCUMULATED (Refers to the competences provided by the study program to which the discipline belongs;)

Professional skills	• Increased capacity for analysis, synthesis, concept and design • Ability to elaborate scientific papers and experimental reports • Ability to critically interpret research results • Ability to quickly and correctly understand and evaluate new information • Modeling, simulation, validation capability
Transversal skills	• Teamwork skills • Oral and written communication skills • Respecting and developing professional values and ethics • Adaptation to new technologies, professional and personal development, through continuous training

D. CONTENT OF THE DISCIPLINE

a) Course

Chapter	Content	No. of hours
1.	Positional-kinematic modeling of modular groups	6
2.	Mobile mechanical systems. Biomechanical systems	9
3.	Strategies and models of movement of mobile mechanical systems	9
4.	Kinematic/kinetostatic modeling of mobile mechanical systems	12
5.	Dynamic modeling of mobile mechanical systems	12
6.	Balancing mechanical systems: static and dynamic concentration of the mass of a kinematic element, balancing moving elements, fundamental theorem of balancing mechanisms	6
7.	Concepts, algorithms and methods for modeling and simulation of mechanical systems	6
8.	Simulation techniques for mobile mechanical systems	6
9.	Control techniques for mobile mechanical systems	6
10.	Case Studies – Mobile Mechanical Systems / Mechatronic Systems	12
	Total hours **6 x** 14 (Weeks)	**84**

b) Experimental module - mechanical / mechatronic systems

Chapter	Content	No. of hours
1.	Modular groups	9
2.	Kinematic/kinetostatic models	27
3.	Dynamic models	18
4.	Modeling / Simulation	36
5.	Command / Control /	18
6.	Case Studies	18
	Total hours 9 x 14 (Weeks)	**126**

1. **EVALUATION** (The methods, forms of evaluation and their weight in establishing the final grade are specified. Indicate minimum performance standards in relation to the competences defined in point **A. Objectives of the discipline**)

Activity Type	Assessment criteria	Assessment methods	Share of final grade
Course	-Accuracy and quality of treatment of exam topics	Written exam	55%
Experience mode	-Application of knowledge acquired in the course	Theme - experimental	45%
Minimum Performance Standard: Knowledge of 70% of the information presented at the course and seminar			

The results of the subject evaluation are quantified in grades, expressed on a scale from 10 to 1, with a minimum threshold of passing grade 5 (five). The stipendium awarded to doctoral students is suspended if they fail to obtain at least grade 8 (eight)

F. METHODOLOGICAL MILESTONES

Lecture combined with dialogue. Use of modern means of training (ppt). Course support.

G. CORROBORATING THE CONTENTS OF THE DISCIPLINE WITH THE EXPECTATIONS OF REPRESENTATIVES OF THE EPISTEMIC COMMUNITY, PROFESSIONAL ASSOCIATIONS AND EMPLOYERS REPRESENTATIVE IN THE FIELD RELATED TO THE PROGRAM

- The discipline provides a wide background of fundamental and practical knowledge on modern methods research, design, testing specific to mobile mechanical / mectronic systems, etc.
- The discipline provides basic elements that help the doctoral student in the specialties of Mechanical Engineering in carrying out research.

H. BIBLIOGRAPHY

1. Comănescu, Adr., Comănescu, D., Dugăeşescu, I., Boureci, A., Basics of mechanism modeling, Politehnica Press Publishing House, Bucharest, 2010, ISBN 978-606-515-115-4.
2. C. Ocnărescu, M. Ocnărescu, „Structure and use of robots", 2012
3. Comănescu, Adr., Programs for modeling, simulation and animation of mechanisms and robots, UPB, 1998-2007;
4. *** Robotics and Autonomous Systems, 1992-2000.
5. Anderson, R.J., Building a modular robot control system using passivity and scattering theory, in: Proc. IEEE Int. Conf. Robotics and Automation, 1996, pp. 698–705.
6. Dumitru Deleanu, Basics of Mechanism Theory, Nautica Publishing House; ISBN: 978-606-681-109-5.2018.
7. Radu P Voinea, Ion V. Stroe, Mihai Valentin Predoi, Technical Mechanics, 2010.

Titular de curs
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