SYLLABUS

1. Program Information

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Department of Automation
1.4 Field of study	Automation, Applied Informatics and Intelligent Systems
1.5 Cycle of studies	Bachelor
1.6 Study Programme/Qualification	Intelligent Automation Systems (dual, in English language)
1.7 Form of education	IF – full-time education
1.8 Course code	29.00

2. Course information

2.1 Course title				**Mechanical Engineering**	
2.2 Course lecturer				*Șl. dr. Ing Anastasios NATSAKIS – tassos.natsakis@aut.utcluj.ro*	
2.3 Laboratory lecturer				*Dr.ing. Ioan Cosma (Emerson)*	
2.4 Year of study	2	2.5 Semester	2	2.6 Type of assessment	E
2.7 Course status	Formative category *(DF, DS, DC)*				DF
	Optionality *(DOB, DOP, DFac)*				DOB

3. Total estimated time

3.1 Number of hours per week	3	of which:	HEI	Lecture	2	Seminar	0	Laboratory	0	Project	0
			CO		0		0		1		0
3.2 Number of hours per semester	42	of which:	HEI	Lecture	28	Seminar	0	Laboratory	0	Project	0
			CO		0		0		14		0

3.3 Distribution of time allocation (hours per semester) for:	HEI	CO
(a) Study based on textbook, course support, bibliography, and notes	14	4
(b) Additional documentation in library, specialized electronic platforms, and fieldwork	4	2
(c) Preparation of seminars/laboratories, assignments, papers, portfolios, and essays	0	3
(d) Tutoring	0	0
(e) Examinations	4	2
(f) Other activities:	0	0
3.4 Total individual study hours (sum (3.3(a)…. 3.3(f)))	22	11
3.5 Total hours per semester (3.2+3.4)	50	25
3.6 Number of credits per semester	2	1

(HEI = Higher Education Institution, CO = Company)

4. Prerequisites (where applicable)

4.1 Curriculum Prerequisites	Physics, Process Modelling
4.2 Competency Prerequisites	Analytical thinking

5. Conditions (where applicable)

5.1. Course organization conditions	Presence is mandatory
5.2. Laboratory organization conditions	Presence is mandatory

6. Specific Competencies Acquired

Professional Competencies	• PC01 Adjust engineering designs • PC03 Approve engineering design • PC08 Design automation components

	• PC11 Develop mechatronic test procedures • PC22, Simulate mechatronic design concepts • PC26, Use information technology tools
Transversal Competencies	• TC01, Apply knowledge of science, technology and engineering • TC05, Interpret mathematical information

7. Learning outcomes

Knowledge:	• The student describes, identifies, summarizes concepts and methods related to systems in general, as well as to measurement techniques and their application in concrete problems, using specific mathematical and physical tools.
Skills:	• The student applies techniques, principles of physics and appropriate mathematical methods to solve common problems in systems engineering, with an emphasis on numerical calculation methods.
Responsibility and autonomy:	• The student carries out processes in systems engineering project management, taking on different roles in the team and clearly and concisely describing the results, verbally and in writing

8. Course Objectives

8.1 General objective of the course	• Acquire knowledge on power conversion machines, and typical sources of vibrations.
8.2 Specific objectives	• Learn how to analyse and interpret acceleration data, learn how to deduct possible failures from data.

9. Contents

9.1 Lectures	No. of hours	Teaching methods	Obs.
Machine elements	4	Presentation, Examples, Practical applications	
Acceleration measurements	2		
Continuoum mechanics	2		
Oscilations of single degree of freedom (SDOF) systems	4		
Damped SDOF systems	2		
Impulse response of SDOF system	2		
Forced vibrations	2		
Multiple Degree of Freedom (MDOF) systems	4		
Eigenvalues, eigenvectors, modal analysis	2		
Signal processing and frequency analysis	2		
Summary	2		

Bibliography

- Schmid, S. R., Hamrock, B. J., Jacobson, B. O. (2014). Fundamentals of Machine Elements: SI Version. USA: CRC Press.
- Klebanov, B. M., Barlam, D. M., Nystrom, F. E. (2007). Machine Elements: Life and Design. USA: CRC Press.
- Jiang, W. (2019). Analysis and Design of Machine Elements. Singapore: Wiley.
- Power Transmission. (1971). United Kingdom: Palgrave Macmillan UK.
- Kovacic, I., Radomirovic, D. (2017). Mechanical Vibration: Fundamentals with Solved Examples. Singapore: Wiley.
- Benaroya, H., Nagurka, M., Han, S. M. (2022). Mechanical Vibration: Theory and Application. (n.p.): Rutgers University Press.

9.2 Laboratory	Hours HEI	Hours CO	Teaching methods	Obs.
Basis of machine health monitoring. Predictive maintenance.	0	2	Presentation, Examples, Practical applications	
Industrial Software for machine health monitoring 1	0	2		
Industrial Software for machine health monitoring 2	0	2		
Data analysis on bearing failure 1	0	2		
Data analysis on bearing failure 2	0	2		
Data analysis on gearbox failure	0	2		
Data analysis on misalignment/unbalanced/loose elements	0	2		

Bibliography

- Emerson internal course: 2068 - Introduction to AMS Machinery Manager
- Emerson internal course: 2074 - Intermediate AMS Machinery Manager
- Emerson internal course: 2088 - AMS Online Prediction Systems

10. Correlation of course content with the expectations of the epistemic community representatives, professional associations, and major employers in the field related to the program

Understanding and application of theoretical aspects within the course in fault identification and predictive maintenance of machine elements using Emerson prediction systems.

11. Evaluation

Activity Type	Evaluation criteria	Evaluation methods	Weight in final grade
11.1 Lecture	Understanding of the theory, ability to calculate response of the systems presented in the lectures.	Written examination	70%
11.2 Laboratory	Applying theory in fault identification with Emerson prediction systems	Computer examination	30%
11.3 Minimum Performance Standard Final mark of lecture and laboratory evaluation should each be ≥ 5			

Date of completion:	Lecturers		Signature
15.09.2025	Course	Ș.l. dr. ing. Anastasios Natsakis	

Date of approval by the Department of Automation Council

24.11.2025

Director of the Department of Automation
Prof.dr.ing. Honoriu VĂLEAN

Date of approval by the Faculty of Automation and Computer Science Council

28.11.2025

Dean
Prof.dr.ing. Vlad MUREȘAN