COURSE SYLLABUS AND COURSE REQUIREMENTS
ACADEMIC YEAR 2024/2025 SEMESTER AUTUMN

Course title	*Structural Dynamics I*
Course Code	MSB387AN
Hours/Week: le/pr/lab	200
Credits	2
Degree Programme	Civil Engineering BSc
Study Mode	Full-time study
Requirements	Exam
Teaching Period	7. semester
Prerequisites	Mechanics II. (Dynamics), Statics III
Department(s)	Department of Civil Engineering
Course Director	Dr Vanda Olimpia Pomezanski
Teaching Staff	Dr Vanda Olimpia Pomezanski, Dr Adél Len

COURSE DESCRIPTION

The aim of the course is to present the basics of vibrations of mechanical structures in civil engineering: elements of vibrating mechanical models (mass, stiffness, rigid and elastic elements); to introduce the students into the analysis of the vibration of one, two and more degrees of freedom mechanical systems, into the modelling of these systems and into the study of the response of mechanical structures to dynamic loads.

SYLLABUS

1. GOALS AND OBJECTIVES

The objective of the course is to introduce the students into the topic of Vibrations, starting from the basics of analysing simple vibrating systems, up to more complex, multi degrees of freedom systems, which can give a good basis especially for the seismic design of the structures.

2. COURSE CONTENT

	TOPICS
LECTURE	1. *One degree of freedom vibrating systems: modelling, undamped and damped vibrations, free and excited vibrations* 2. *Two or more degrees of freedom systems free and excited vibrations, analytical and numerical methods, the effect of damping on these systems* 3. *Excitation by support displacement, mechanical background of seismic design*

DETAILED SYLLABUS AND COURSE SCHEDULE

LECTURE

week	**Topic**	**Compulsory reading; page number (from … to …)**	**Required tasks (assignments, tests, etc.)**	**Completion date, due date**
1.	Vibrations of single degree of freedom (1DoF) systems Types of 1DoF mechanical systems. Modelling vibrating systems Undamped vibrations Free, undamped 1DoF harmonic vibrations Vertical, undamped vibrations in gravitational field Damped vibrations - introduction (Dr. Adél Len)	[1] pages 62 – 71 [2] pages 583-586 [3] pages 631 – 635 [2] pages 586-590 [3] pages 655 – 657		

2.				
3.				
4.				
5.				
6.				
7.	Damped vibrations Free, damped, 1DoF harmonic vibrating systems systems Excited vibrations Categories of excitations Harmonic force excitation Harmonic displacement excitation (Dr. Adél Len)	[2] pages 600 – 606 [3] pages 651 – 653 [3] pages 658 – 659	3. Multiple choice test 1DoF vibrations – Neptun	Week 14.
8.	Matrix differential equation of 2DOF mechanical systems. Examples. (Dr Vanda Olimpia Pomezanski)	[4] sec 7. pp.173-191,[5]		
9.				
10.	Stiffness matrix definition by the flexibility matrix. Examples. Stiffness matrix definition by the elementary stiffness matrices. Examples. (Dr Vanda Olimpia Pomezanski)	[4] sec 8. pp. 192-218,[5]		
11.	Solution of 2DOF mechanical systems in the field of eigenvalues. Examples. 2DOF damped vibration systems. Examples. (Dr Vanda Olimpia Pomezanski)	[4] sec 9. pp. 219-248,[5]	Midterm exam 2. (Dr Vanda Olimpia Pomezanski)	
12.				
13.	Support vibration of 1DOF and 2DOF mechanical systems. Examples. (Dr Vanda Olimpia Pomezanski)			
14.				

3. ASSESSMENT AND EVALUATION

ATTENDANCE

In accordance with the Code of Studies and Examinations of the University of Pécs, Article 45 (2) and Annex 9. (Article 3) a student may be refused a grade or qualification in the given full-time course if the number of class absences exceeds 30% of the contact hours stipulated in the course description.

In case of illness, it is necessary to present a medical certificate. In case of absence, the student makes up for the missed class material.

Method for monitoring attendance *(e.g.: attendance sheet / online test/ register, etc.)*

Attendance sheet

ASSESSMENT

Course-unit with final examination

Mid-term assessments, performance evaluation and their weighting as a pre-requisite for taking the final exam

Type	Assessment	*Weighting as a proportion of the pre-requisite for taking the exam*
1. ***Multiple choice test (Neptun) (Dr. Adél Len)***	*Completion of the tests to a minimum of 40 %*	*100 %*

2. *Midterm exam* ***(Dr Vanda Olimpia Pomezanski)***	*Completion of the exam to a minimum of 40 %*	*100 %*

Requirements for the end-of-semester signature

Completion of the Multiple-choice test (in Neptun, required minimum: 40%) and the Midterm exams (required minimum: 40%) The midterm exam should be submitted in electronic and in printed format as well. The exam will only be submitted if both formats are received on time.

Re-takes for the end-of-semester signature (PTE TVSz 50§(2))

The multiple choice tests can be retaken once in the first week of the exam period. Midterm exam can be retaken once in the first week of the exam period.

Type of examination *(written, oral):*

The final exam will be oral with personal presence (separate exams for 1DoF systems and Multiple DoF systems will be held). The result of each exam must reach the minimum acceptable level (40% of the maximum points).
Registering for the final exam is only possible with the completed multiple choice test and the midterm exam.

The exam is successful if the result is minimum 40%. *(The minimum cannot exceed 40%.)*

Calculation of the grade *(TVSz 47§ (3))*

Multiple choice test for 1DoF systems: **10%**
Oral exam for 1DoF systems accounts for **40%.**
Mid-term exam for multiple DoF systems accounts for **25%.**
Oral exam of multiple DoF accounts **25%.**

Calculation of the final grade based on aggregate performance in percentage.

Course grade	Performance in %
excellent (5)	85 % …
good (4)	70 % ... 85 %
satisfactory (3)	55 % ... 70 %
pass (2)	40 % ... 55 %
fail (1)	below 40 %

The lower limit given at each grade belongs to that grade.

4. SPECIFIED LITERATURE

In order of relevance. (In Neptun ES: Instruction/Subject/Subject details/Syllabus/Literature)

COMPULSORY READING AND AVAILABILITY

[1] Adél Len (2021): *Mechanics II. Dynamics – lecture notes*, University of Pécs, Faculty of Engineering and Information technology, Pécs – Availability: uploaded to the MS Teams group
[2] J.L. Meriam, L.G. Kraige (2003): Engineering Mechanics, Dynamics, Editor: John Wiley and Sons, Availability: https://oxvard.files.wordpress.com/2018/05/engineering-mechanics-dynamics-7th-edition-j-l-meriam-l-g-kraige.pdf
[3] R. C. Hibbeler: Engineering mechanics. Dynamics, Editor: Prentice Hall, 13th edition, Availability: https://www.academia.edu/43072240/Hibbler_ENGINEERING_MECHANICS_DYNAMICS_12th_EDITION
[3] Mario Paz, Young Hoon Kim 2004: Structural Dynamics, Theory and Computation, Sixth Edition, Springer, Cham, Switzerland

RECOMMENDED LITERATURE AND AVAILABILITY

[4.] Lecture slides – Microsoft Teams
[5.] Beer, F.P., Johnston, E. R.: Vector Mechanics for Engineers., 2004: *Dynamics*, McGraw-Hill
[6.] William T. Thomson, 1996: *Theory of Vibration with application*, Springer Science and Business Media