MISKOLCI EGYETEM
Gépészmérnöki és Informatikai Kar
Műszaki Mechanikai Intézet
3515 Miskolc - Egyetemváros

01 September 2025

MM/73/2025.

NOTICE

REQUIREMENTS OF THE SUBJECT
MECHANICAL VIBRATIONS (GEMET101-MA)
IN THE FALL SEMESTER OF THE ACADEMIC YEAR 2025/2026

OBJECTIVES

The main objective of this course is to provide students an introduction to the Theory of Vibrations. A further aim is to present the fundamental concepts, principles and methodologies with applications to engineering problems.

GETTING THE SIGNATURE

There are two lectures and two practical classes a week during the fourteen-week term-time. Regular attendance at the classes is compulsory. **Two midterm exams** are to be written during the semester. Each lasts for **45 minutes** and the **maximum score is 40**. Students are expected to score altogether at least **32 (40%) to get the signature**. The midterm exams are to be held on **week 6 and 12**. Students who do no achieve the minimum prescribed score have to take a **make-up exam** on **week 14**. This exam lasts for **45 minutes**, the **total score is 40** and the **passing score is 16 (40%).**
Students who fail to get the signature in the term-time can **make-up for the signature in the examination period**. This make-up exam lasts for **45 minutes**, the **total score is 40** and the **passing score is 20 (50%).**

TAKING THE FINAL EXAM

Students with signature have to take the final exam in the examination period to complete the course. This written exam is **45 minutes** long and the mark depends on the performance as shown in the proceeding table:

Score	0-19	20-23	24-27	28-31	32-
Mark	**Fail (1)**	**Pass (2)**	**Fair (3)**	**Good (4)**	**Excellent (5)**

To reward regular work, one quarter of the score above 32 achieved in the term-time is added to the total score of the final exam.

TEXTBOOKS

1. G. Szeidl, L. P. Kiss: Mechanical Vibrations – An Introduction, Foundations of Engineering Mechanics Series, Springer Nature, 2020
2. H. Dresig, F. Holzweißig: Dynamics of Machinery, Theory and Applications, Springer-Verlag Berlin Heidelberg, 2010
3. F. P. Beer, E. R. Johnston, Jr., D. F. Mazurek, P. J. Cornwell, E. R. Eisenberg: Vector Mechanics for Engineers, Statics and Dynamics. McGraw-Hill, 2010

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SCHEDULE

Week No.

1	Model creation, fundamental theorems of rigid body dynamics.
2	Direct central impact. Deformation and restitution. Perfectly plastic impact. Perfectly elastic impact. Maxwell diagram. Oblique central impact.
3	Components of vibrating systems. Systems with one degree of freedom. Classification. Free and forced vibrations with and without damping. Overdamped and underdamped systems. Displacement excitation.
4	Elastically mounted rigid machines. Foundations with one (and two) degrees of freedom. Active and passive vibration absorption.
5	Principle of virtual work. Lagrange's equations for multidegree of freedom systems. Generalized forces. Examples.
6	Multidegree of freedom systems. Eigenfrequencies and eigenvectors. Forced linear vibrations. Resonance. Coupled and uncoupled systems. The first midterm exam.
7	Holiday.
8	Algebraic eigenvalue problems. Flexibility and stiffness matrix. Properties of the eigenvalues and eigenvectors.
9	Determination of the response to non-harmonic excitations if the eigenvectors are given.
10	Uniformity and stability of rotation. Statically and dynamically balanced shafts. Determination of the reactions.
11	Single mass rotor on rigid bearings. Critical angular velocity. Laval theorems.
12	Gyroscopic effect and its influence on the critical angular velocity. The second midterm exam.
13	Systems with infinite degrees of freedom. Longitudinal, torsional and bending vibrations.
14	Summary. Repeating the midterm exams failed.

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