



UNIVERSITY OF MISKOLC

**FACULTY OF
EARTH AND ENVIRONMENTAL
SCIENCES AND ENGINEERING**

ENGINEERING PHYSICS

Earth Science Engineering MSc

2026/2027 1. Semester

COURSE COMMUNICATION FOLDER

**University of Miskolc
Faculty of Earth and Environmental Sciences and Engineering
Institute of Exploration Geosciences**

Course datasheet

Course Title: Engineering physics Responsible instructor (name, position, scientific degree): Dr. Anett Kiss, assistant professor	Neptun code: MFGFT7100011 Responsible department/institute: Institute of Exploration Geosciences / Department of Geophysics Type of course: K
Position in Curriculum (which semester): 1	Pre-requisites (if any): none
Number of Contact Hours per Week (lec.+prac.): 2+1	Type of Assessment (examination / practical mark / other): exam
Credits: 4	Course: full-time Program: Earth Science Engineering MSc
Course Description: Within the framework of the Earth Science Engineering MSc program, the students gain deepening knowledge in those fields of continuum physics, which are necessary to understand the geological processes and geophysical methods. Competencies to evolve: Knowledge: T1, T2 Ability: - Attitude: A3, A4, A5, A7 Autonomy and responsibility: F1, F2, F3, F4, F5	
The short curriculum of the subject: The principles of continuum physics. The relationship between the micro- and macroscopic descriptions, averaging in time and space. The kinematical principles of deformable continuum, deformation tensor. Volume and surface forces, stress tensor. Basic equations of continuum mechanics, continuity theories. The equation of motion of elastic continuum, integral and differential forms. Law of conservation of mass, continuity equation. Extensive and intensive quantities, the 0 th law of thermodynamics. General forms of law of conservation of mass. Material equations, Curie's law. Perfectly elastic body, linearly elastic body. Equation of motion of Hooke body. Fluid models, ideal fluids, viscous fluids. Newton body, Navier-Stokes body. Rheological models, Kelvin-Voight model, Maxwell model, Poynting-Thomson's law for material and motion equation of standard body. Wave propagation in linearly elastic medium. Solutions of wave equation. Wave propagation in different rocks, dispersion, absorption. Disperse waves.	
Assessment and grading: Attendance at lectures is regulated by the university code of education and examination. Writing two tests at least grade 2 (pass), respectively during the semester is the requirement of signature. Exam grading scale: fail (0-45%), pass (46-60%), satisfactory (61-70%), good (71-85%), excellent (86-100%).	
The 3-5 most important compulsory, or recommended literature (textbook, book) resources: 1. Dobróka M., Somogyiné M. J. 2014: An introduction to continuum mechanics and elastic wave propagation. Lecture notes. University of Miskolc. 2. K. Aki and P. Richards. Quantitative seismology. vol. 1: Theory and Methods. W H Freeman & Co (1980) 3. K. Aki and P. G. Richards. Quantitative seismology. vol. 2: Theory and Methods. W H Freeman & Co (1980) 4. Hudson J.A.1980. The excitation and propagation of seismic waves. Cambridge University Press 5. Schön J. 1998. Physical properties of Rocks. In. Seismic Exploration vol. 18.	

Syllabus of the semester

Week	Lecture
September 7.	The principles of continuum physics. The relationship between the micro- and macroscopic descriptions, averaging in time and space.
September 14.	The kinematical principles of deformable continuum, deformation tensor.
September 21.	Volume and surface forces, stress tensor. Basic equations of continuum mechanics, continuity theories.
September 28.	The equation of motion of elastic continuum, integral and differential forms.
October 5.	Law of conservation of mass, continuity equation.
October 12.	Midterm test. Extensive and intensive quantities, the 0 th law of thermodynamics.
October 19.	General forms of law of conservation of mass. Material models, Curie's law.
October 26.	Holiday declared by Dean.
November 2.	Perfectly elastic body, linearly elastic body. The moduli and their relationship in Hooke body. Equation of motion of Hooke body.
November 9.	Fluid models, ideal fluids, viscous fluids. Newton body, Navier-Stokes body.
November 16.	Rheological models, Kelvin-Voight model, Maxwell model, Poynting-Thomson's law for material and motion equation of standard body.
November 23.	Wave propagation in linearly elastic medium. Solutions of wave equation.
November 30.	Midterm test. Solution of plane and spherical wave, complex waves. Law of reflection and refraction.
December 7.	Repeat midterm test. Wave propagation in different rocks, dispersion, absorption. Disperse waves.

Week	Seminar
September 7.	The principles of continuum physics. The relationship between the micro- and macroscopic descriptions, averaging in time and space.
September 14.	The meaning of elements of deformation tensor. Volume and surface forces, stress tensor. The meaning of elements of stress tensor.
September 21.	Deformation and stress spherical tensor and deviator tensor.
September 28.	The equation of motion of elastic continuum, integral and differential forms. Exercise of deductions.
October 5.	Law of conservation of mass, continuity equation. Samples.
October 12.	Midterm test. Material equations, Curie's law. Relationship to thermodynamics. Samples.
October 19.	Material equations, Curie's law. Relationship to thermodynamics. Samples.
October 26.	Holiday declared by Dean.
November 2.	The moduli and their relationship in Hooke body. Samples. Thermodynamically relations.
November 9.	Equation of motion of Hooke body, forms of Lamé equations.
November 16.	Pascal body. Newton body, Navier-Stokes body. First and second viscosity. Volumetric viscosity.
November 23.	Kelvin-Voight body, Maxwell body, Poynting-Thomson's law for material and motion equation of standard body. Creep, relaxation. Special loading examples.
November 30.	Monochromatic solution of wave equation, meanings of the parameters. Phase velocity, group velocity.
December 7.	Law of reflection and refraction. Exercise of deductions. Deepening of the knowledge. Examples. Dispersion, absorption, examples.

Sample for the mid-term exam

Write the three parts that define the kinematics of a deformed body and identify each of the parts!

The solution can be found in the university lecture book „An introduction to continuum mechanics and elastic wave propagation“.

Sample for the written exam

Please, write down the material equation of Hooke-body and deduce the motion of equation!

The solution can be found in the university lecture book „An introduction to continuum mechanics and elastic wave propagation“.