Technical Physics I

Summer semester 2024/25

Week	Lecture	Lecturer
1.	**Fundamentals of the vector calculus.** Scalar and vector quantities. Geometrical interpretation of vector. The unit vector. Addition and distractions of vectors. Components and coordinates of vectors. Multiplication of vectors.	RNDr. Leja
2.	Derivative of vectors. Gradient of the scalar functions. Divergence and curl of the vector functions. Integration of the vector functions.	RNDr. Leja
3.	**Kinematics of the point particle.** The position vector of the point particle. Derivative of the position vector. Velocity of the point particle. Acceleration of the point particle.	Doc. Sivý
4.	Circular motion of the point particle. Angular velocity, angular acceleration and the relation between them. Derivative of the unit vector. Acceleration decomposition into tangential component and normal component.	Doc. Sivý
5.	Calculations of the velocity and the path from acceleration. Examples of simple motion. Composite motion.	Doc. Sivý
6.	**Dynamics of the point particle.** Newton laws of dynamics. Inertial and non-inertial reference frames. Equation of motion of the point particle.	Doc. Sivý
7.	Impulse and momentum. Mechanical work. Kinetic energy. Potential energy. Conservation of energy in the conservative field.	Doc. Sivý
8.	**Mechanics of the system of particles and the rigid body.** Reduction of forces in the rigid body. First and second equation of motion of the system of particles and the rigid body. The center of mass of the system of particles and the rigid body. The equilibrium conditions of the system of particles and the rigid body.	Doc. Sivý
9.	Rotation of the rigid body about the fixed axis. Equation of motion of the rotating rigid body. Moment of inertia. Steiner’s theorem. Angular momentum conservation law. Kinetic energy of the system of particles and the rigid body.	Doc. Sivý
10.	Physical pendulum. Mathematical pendulum. Reduced pendulum length. Torsional pendulum. Laws of conservation.	Doc. Sivý
11.	**Gravitational field.** Newton’s law of universal gravitation. Gravitational field and gravitational potential. The relation between gravitational field and gravitational potential.	RNDr. Leja
12.	Gravitational field of the Earth. Motion in the gravitational field.	RNDr. Leja
13.	**Theory of relativity.** Lorentz transformation. Some consequences of the special theory of relativity. Length contraction, time dilation. The force transformation.	RNDr. Leja