F003	Elective 3rd Year	**Electrodynamics I**	L	S	P	ECTS
			2	0	2	5

Course objective. Theoretical understanding of basic laws of electrostatics, magnetostatics as well as electrodynamics in vacuum, and be possible to solve different problems in this field.

Prerequisites. Differential calculus, Integral Calculus, Multivariable Calculus, Fundamentals of Physics, Classical Mechanics.

Course content.

1. Vector Analysis
    - Vector algebra
    - Differential calculus
    - Integral calculus
    - Curvilinear coordinates
    - The Dirac delta function
2. Electrostatics
    - Coulomb's law
    - of the electric field
    - on the principle of linear superposition
    - of Gauss' law
    - of the scalar potential - Poisson equation
    - Work on the charge in an electrostatic field
3. Magnetostatic
    - magnetic induction and Biot-Savart law
    - the vector potential calibration freedom
    - Multipole on development
    - the magnetic moment
    - force and torque on the localized currents in a given magnetic field
4. Electrodynamics in a vacuum
    - charge motion in default electromagnetic fields
    - motion in a constant homogeneous fields
    - motion in periodic fields
    - Maxwell's equations in vacuum
    - electromagnetic field of the charge and current whose motion default
    - the continuity equation
    - Maxwell's equations away from the current and charge - electromagnetic waves, polarization
    - energy and momentum of electromagnetic fields
    - Lienard-Wichert potentials

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Understand and correctly express the fundamental laws of electrostatics.

2.	Describe and interpret the basic properties of the electric field.
3.	Understand and correctly express the fundamental laws of magnetostatics.
4.	Describe and interpret the basic properties of the magnetic field.
5.	Describe the basic principles of electrodynamics in a vacuum.
6.	Understand, interpret and apply knowledge of Maxwell's equations to problems.
7.	Understand the concept of an electromagnetic wave, its structure and properties.
8.	Understand the energy-momentum concept of an electromagnetic field.
9.	Understand the way and reasons for introduction of electromagnetic potentials and consequently gauge freedom.
10.	Describe and understand the effects of radiation in electrodynamics.

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME **	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max
Attending lectures	1	1-11	The presence in the classroom	Signing during the class	0	5
Attending exercises	1	1-11	The presence in the classroom	Signing during the class	0	5
Homework	1	1-11	Solving homework	Written submission of assignments	0	10
Knowledge verification by tests	1	1-11	Continuous work throughout the semester	Written midterms (successfully passed tests replace the written examination)	25	40
Final exam	1	1-11	Repeating material	Written exam (if not satisfy the prague passing the colloquium), verbal exam	25	40
TOTAL	5				50	100

Teaching methods and knowledge assessment. Lectures and exercises are mandatory. The exam is in writing and oral form.

Can the course be taught in English: Yes

Basic literature:

1. David J. Griffiths, Introduction to Electrodynamics (4th Edition), Pearson, 2012

Recommended literature:

1. J. D. Jackson: Classical Electrodynamics, 3rd edition, John Wiley, New York, 1998