Type of study : Bachelor in physics, Integrated studies- master professor of physics
Module title: Special Theory of Relativity
Module type: Elective
No ESPB: 6
Prerequisites : Theoretical Mechanics, Fundamentals of Mathematical Physics
Module aims: Students will get to know with basic concepts of theory of relativity. Working on concept of time, space and causality. Expanding intellectual horizon and training for theconfrontation with open problems on the front of scientific thought.
Learning outcomes: On completion of this module, student should be able to understand basic ideas and reasoning behind the development of special theory of relativity and its application to the other fields. Student should also be able to follow the literature in the field, to develop ability to analyse the problem and to develop critical way of reasoning. Student will know basic ideas of kinematics, dynamics and electrodynamics of special theory of relativity (STR), but also the technique for serious approach to further relativistic disciplines.
Syllabus: Introduction. Michelson-Morley experiment. Attempts to overcome the contradictions. Basic ideas of Einstein theory of relativity, postulates of special theory of relativity. Lorentz transformation. Consequences of Lorentz transformation. Minkowski space. Scalars, vectors and tensors in Minkowski space. Covariant and contravariant entities. Kinematical and dynamical elements of the particle in Minkowski space. Covariant formulation of physical laws. Relativistic mechanics. Covariant formulation of laws of mechanics. Relativistic kinematics. Basic dynamical equation in covariant form. Energy and impulse. Relativistic dynamics of collision processes. Hamilton principle. Covariant formulation of electrodynamics of vacuum. Covariant formulation of electromagnetic potentials. Covariant formulation of Maxwell equations for vacuum. Covariant formulation of electrodynamics of material environment. Covariant formulation of Lorentz force. Charged particle motion in electromagnetic field.
Reading list: 1. M. Belloni, W. Christian, A. Cox, Physlet Quantum Physics: an interactive introduction, Pearson Education, Inc. 2006. 2. N. M. J. Woodhouse, Special Relativity, Springer, London, 2003. 3. H. Stephani, Relativity – An Introduction to Special and general Relativity, Cambridge, University Press, 2004.
Contact hours: 3+1
Methods of delivery: Lectures (3 hours per week), exercise (1 hour per week),