Study programmes: BACHELOR STUDIES – Astronomy and Astrophysics

Course name: Electrodynamics 2

Lecturers: Voja Radovanović and other lecturers

Status: Optional

ECTS: 5

Attendance prerequisites: Electrodynamics 1

Course aims: This course is a continuation of Electrodynamics 1. The aim of this course is applying general theoretical methods of Electrodynamics 1 on special problems: static fields, radiation, fields in matter, electromagnetic waves etc.

Course outcome: Students can understand and solve problems in Electrodynamics and to apply Electrodynamics in advanced areas of physics.

Course content:

1. Electrostatics. Dipole layers. Poisson's Equation and uniqueness of its solution. Poisson-Green equation. 2. Laplace equation in spherical, cylindrical and cartesian coordinates. 3. Electrostatics of conductors. Methods of images. Green functional method. 4. Dielectric matter in electrostatic field. Clausius Mossotti equation. Models of the molecular polarisability. Forces and energy . 5. Magnetostatic field in matter. Paramagnetism. Diamagnetism and ferromagnetism . 6. Electromagnetic waves in vacuum and nonconducting medium . Monochromatic plane waves . Polarization of waves . Doppler effect. 7. Electromagnetic field in cavity. Planck law of radiation. 8. Green function for wave equation. Lienard Wiecher potentials and fields. 9. Radiation of charged particles. Electric dipole, magnetic dipole and quadrupole radiation. Radiation of linear antenna . Radiation of relativistic particles. 10. Quasistatic field. Skin effect. 11. Frequency dispersion. Poyning's theorem for dispersive media. Classical models for dispersion of dielectric constant and conductivity. Kramers-Kroning relations 12. Spatial dispersion. 13. Electromagnetic waves in homogenious matter. Groupe velocity. 14. Electromagnetic waves in anisotropic matter. 15. Scattering of electromagnetic waves. Thomson and Rayleigh scattering. Blue sky.

Literature:

1. J. D. Jackson, Classical Electrodynamics, J. Wiley and Sons (1999)
2. L. Landau and L. Lifshitz, Classical Theory of Fields, Butterworth-Henemann (1975)
3. L. Landau and L. Lifshitz, Electrodynamics of Continous Media, Elsevier (1979)
4. V. V. Batygin and I. N. Toptygin, Problems in Electrodynamics, Academic Press (1964)
5. V. Radovanović, Elektrodinamika, Beograd (2017)

Number of hours: 4	**Lectures**: 2	**Tutorials**: 2	**Laboratory**: -	**Research**: -

Teaching and learning methods: Frontal / Tutorial

Assessment (maximal 100 points)

Course assignments	**points**	**Final exam**	**points**
Lectures	10	Written exam	30
Exercises / Tutorials	-	Oral exam	40
Colloquia	-	Written-oral exam	-
Essay / Project	20		