Galactic and Intergalactic Magnetic Fields - astro848

Degree - M.Sc. in Astrophysics (PO von 2014)

Module	**Elective Advanced Lectures: Observational Astronomy**
Module No.	astro840

Course	**Galactic and Intergalactic Magnetic Fields**
Course No.	astro848

Category	**Type**	**Language**	**Teaching hours**	**CP**	**Semester**
Elective	Lecture with exercises	English	2+1	4	ST

Requirements for Participation:

Preparation: Good knowledge of electrodynamics and astronomy

Form of Testing and Examination: Requirements for examination (written or oral): successful work with the exercises

Length of Course: 1 semester

Aims of the Course: The students shall become familiar with relativistic plasmas in astrophysics. They shall comprehend the origin and significance of magnetic fields in diffuse astrophysical media. The potential role of magnetic fields in the evolution of the universe will be discussed. The detection and quantitative measurements of magnetic fields in the ISM and IGM shall be conveyed, along with a description of the current and future observational facilities.

Contents of the Course: Introduction: magnetism, physical quantities, history, observational evidence; radiation processes: radiation transport, free-free radiation, synchrotron radiation, inverse-Compton radiation, propagation effects; diagnostics: optical polarisation, synchrotron radiation, Faraday rotation, Zeeman effect; radio continuum observations: total and polarised intensity, rotation measure, RM synthesis, telescopes; Milky Way: diffuse ISM, molecular clouds and star-forming regions, supernova remnants, diffusive shock acceleration, cosmic rays, origin and maintenance of magnetic fields, galactic dynamo; external galaxies: spiral galaxies, dwarf irregular galaxies, elliptical galaxies, origin of magnetic fields; active galactic nuclei: radio galaxies, quasars, Seyfert galaxies, origin of magnetic fields; intergalactic magnetic fields: clusters of galaxies, radio halos, radio relics, mini-halos, magnetisation of the IGM, cosmological shocks; cosmological magnetic fields

Recommended Literature:

M.S. Longair: High Energy Astrophysics, Vol. 1+2 (Cambridge University Press, 2008)

S. Rosswog, M. Brüggen: Introduction to High-Energy Astrophysics (Cambr. Univ. Press 2009)

L. Spitzer: Physics of Fully Ionized Gases (Dover Publications , 2006)

Lecture Notes (U. Klein)