Corso di Laurea Specialistica in Scienze Fisiche.
A.A. 2007-2008 I Sem.
Astrofisica II
Titolare: Prof. S. N. Shore

Programma.

1. Radiative Processes

Statistical equilibrium and the LTE vs. NLTE question
Ionization and recombination
Absorption and emission processes: Source function
Rosseland mean opacity and optical depth scales
Continuum opacity mechanisms: bound-free, bremsstrahlung, synchrotron
Autoionization
Maser and laser mechanisms in astrophysics
Line profiles: Voigt profiles
Scattering processes in static and moving media
Equation of transfer in planar and spherical geometries
Moments of the transfer equation, Eddington approximation
The stellar atmosphere problem and the inverse problem
The radiative transfer basis of stellar spectral classification
Curve of growth as an approximation
The "Greenhouse Effect" and planetary atmospheres
Radiation pressure and radiative diffusion
Zeeman effect and effects on line profiles
Stark broadening: impact and quasi-static broadening
Line opacity in static and moving atmospheres
Line formation in low density media

2. Hydrodynamics

Kinematic distribution functions
Vlasov and Boltzmann equations
Equations of fluid mechanics
Bernoulli flows
Shocks
Similarity solutions
Naier-Stokes equation and viscosity
Fundamental fluid instabilities: Kelvin-Helmholtz, Rayleigh-Taylor
Turbulence
Convection
Radiatively driven outflows
Possible toipics: Magnetic dynamos, Accretion disks

Language of instruction: English and Italian

Examinations: oral examination

Tutorials will be available during the semester and problems will be dtsirbuted

Recommended texts:

Mihalas, D. 1978, Stellar Atmospheres - 2nd Ed. (W. H. Freeman)
Mihalas, D., Mihalas, B. 1984, Foundations of Radiation Hydrodynamics (Dover)
Shore, S. N. 2007, Asrophysical Hydrodynamics: An Intrduction (VCH/Wiley)
Shore, S. N. 2003, The Tapestry of Modern Astrophysics (Wiley/Interscience)
Shu, F. H. 1992, The Physics of Astrophysics vol. 2 (Univ. Science Books)