

Module: Elective Advanced Lectures: Modern Astrophysics

Module No.: astro850

Course: Introduction to MoND

Course No.: astro8505

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	2+1	0	ST

Requirements for Participation:

Preparation:

Form of Testing and Examination:

Requirements for the examination (written): successful work with exercises

Length of Course:

1 semester

Aims of the Course:

The aim of this course is to provide an introduction to Modified Newtonian Dynamics (MoND) as a successful alternative for dark matter.

Contents of the Course:

- 1) Observational basis: baryonic Tully-Fisher relation (BTFR), radial acceleration relation (RAR), dynamical friction, planes of satellites, rotation curves of galaxies, pattern speed of spiral galaxies, tidal dwarf galaxies, stability of galactic disks, asymmetries of stellar tidal tails, galaxy and structure formation, wide-binary evolution
- 2) Theoretical framework: classical field theory, generalised Poisson equation, quadratic MoND formulation (AQUAL), quasi-linear MoND formulation (QUMOND), pressure and rotationally supported systems, external field effect (EFE), modified gravity vs. modified inertia, discrete N-body systems in MoND, inverse Lagrangian problem, higher order Lagrangian theory, general relativistic embedding
- 3) Numerical treatment: Solving the PDEs of AQUAL and QUMOND numerically, overview and usage of existing software packages for MOND simulations, first steps in MoNDian direct N-body dynamics
- 4) Open questions and current research status

Recommended Literature:

No textbook exists for this topic at the moment. Lecture notes and access to original research literature will be provided.