



UNIVERSITÀ
degli STUDI
di CATANIA

DIPARTIMENTO DI FISICA E ASTRONOMIA

DOTTORATO DI RICERCA IN FISICA

ANNO ACCADEMICO 2017 - 2018

Star-planet interactions in extrasolar planetary systems 2 CFU

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Reception hours: 9-11 a.m. from Monday to Friday by appointment (please send an email to the above address)

Program of the course:

1. **Introduction:** the exoplanet zoo; kinds of star-planet interactions in the Solar System and in extra-solar systems;
2. **Tides and exoplanets:** introduction to equilibrium and dynamic tides in star-planet systems; effects of gravitational tides on the orbital and spin evolution of exoplanets; effects of tides on the host star; impact of the stellar angular momentum evolution on the orbits of close-by planets; thermal tides and exoplanet rotation.
3. **Stellar magnetic fields and exoplanets:** kinds of magnetic star-planet interactions; comparison with the Jupiter-Io system; possible impact on the evolution of the stellar angular momentum;
4. **Stellar irradiation and exoplanets:** atmospheric evaporation and exoplanet thermal evolution; the inflated planet problem.

Bibliography:

- [1] M. Perryman, *The Exoplanet Handbook*, 2014, Cambridge Univ. Press
[2] H. Deeg and J. A. Belmonte, *Handbook of Exoplanets*, Springer, New York, 2018; Section on Stars and Their Planets: Interactions
[3] J.-P. Zahn, *Tidal Dissipation in Binary Systems*, EAS Publ. Series, vol. 29, 2008
[4] A. Strugarek, *Models of Star-Planet Magnetic Interaction*, 2017, arXiv:1704.03254

Recent research papers will be suggested to cover specific topics of this rapidly evolving field.