Planetary Astrophysics

1) Planets and Exoplanets: physical and dynamical properties, formation, evolution

2) Planetary magnetic fields: charged particle motions, Van Allen belts, solar wind and magnetosphere, plasma torus.

3) Non-gravitational forces: thermal forces (radiation pressure and Poynting-Robertson drag), Yarkovsky and YORP, gas drag. Implications for debris disks and planet formation.

4) Three-body problem: Hill's sphere and application to asteroid satellites and cataclismic variables, trojan and horseshoe orbits.

5) Tides: tidal evolution of satellites and planets

6) Spin orbit resonances: resonances between the rotation rate of a satellite and its orbital frequency, chaotic evolution

7) Gravitational field of irregular bodies: effects on the dyanamics of satellites (natural or artificial)

8) Circumstellar disks: fluid dynamics equations, disk evolution and migration of embedded planets

9) Secular theories for N-planets: Laplace-Lagrange linear theory and Kozai model.

10) Mean motion resonances: between asteroids and planets and planets vs planets.

11) Planetary interiors: state equations

Books:

1) Marzari, F.: Planetary Astrophysics
https://www.cambridgescholars.com/product/978-1-5275-0118-8
2) DePater & Lissauer: "Planetary Science" (Solar System physical properties)
3) Goldston & Ruthford: "Introduction to Plasma Physics" (magnetic fields)
4) Murray & Dermott: "Solar System Dynamics" (dynamics)
5) Thompson: "An introduction to Fluid dynamics" (fluid dynamics)
6) Armitage: " Astrophysics of planet formation" (circumstellar disks and dust evolution)

On-line slides: www.pd.infn.it/~marzari