ASTRONOMY 6570 — PHYSICS OF THE PLANETS

Tues & Thurs, 11:40 - 12:55 pm, SSB 301
Instructor: P. Nicholson, room 418
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Course Outline: Spring 2020
(last revised 8 Jan 2020)

0. INTRODUCTION (2 lectures)............................ Jan 21 - 23
   1. Historical review
   2. Coordinate systems & time scales

I. ORBITAL MECHANICS (4 lectures).................... Jan 28 - Feb 6
   1. Kepler's laws & planetary orbits
   2. Perturbation theory & orbital precession
   3. Secular perturbations & resonances

II. ROTATION, FIGURES & GRAVITY FIELDS (4) .... Feb 11 - 20
   1. Rotation & oblateness
   2. Gravity fields & figures of equilibrium
   3. Free & forced pole precession

III. TIDES & ORBITAL EVOLUTION (3) ............... Feb 27 - Mar 5
    1. Tidal torques & evolutionary timescales
    2. Evolution of the Earth-Moon system

IV. PLANETARY RINGS (2) .............................. Mar 10 - 12

V. REFLECTED & THERMAL RADIATION (4) .........Mar 17 - 26
   1. Photometric measurements; light scattering
   2. Thermal emission & thermal equilibrium
   3. Sub-surface temperature profiles

<<< SPRING BREAK: Mar 30 - Apr 3 >>>

VI. PLANETARY ATMOSPHERES (4) ..................... Apr 7 - 16
   1. Vertical structure; rad. time constants
   2. Radiative equilibrium profiles; 2-stream approx.
   3. Buffered atmospheres; condensation
VII. PLANETARY INTERIORS (4) ........................................... Apr 21 - 30
   1. Seismology & the Earth's interior
   2. Terrestrial planets & icy satellites
   3. Jovian planets: observational constraints
   4. Jovian planet models; polytropes & "real" planets

VIII. SPARE LECTURE (1) .................................................. May 5

Guest lectures: April 16

Grading:
7 bi-weekly problem sets will account for 75% of the course grade; a term paper with accompanying in-class presentation (to be scheduled during the Final exam week) will cover 25%. There will be no mid-term or final exam.

Nominal homework due dates:
   1. SS models & Coordinate systems ... Feb 4
   2. Orbital mechanics ......................... Feb 18
   3. Planetary figures .......................... Mar 3
   4. Tides & Rings ............................. Mar 17
   5. Radiation ................................. Apr 7
   6. Atmospheres ............................. Apr 21
   7. Planetary interiors ..................... May 5

Reference books:
A good general text at the level of this course is:

Much of the material we will cover can also be found in one or more of the following more specialized texts:
   Murray & Dermott "Solar System Dynamics" (1999)
   Hubbard "Planetary Interiors" (1984)
   Andrews "Intro. to Atmospheric Physics" (2000)

Lecture Notes:
The lecture notes from last time are posted on the Course website, at
These are arranged by subject, rather than by individual lecture.