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ASTR 509: Physical Foundations of Astrophysics III: Stellar Dynamics

Željko Ivezić
University of Washington, Winter Quarter 2005

Location and Time: Tuesday, Thursday: 2:30-3:50 PAA A210

Office Hours: Any time when my office door is open.

Grading: 2 closed-book exams 30% each, 10 homeworks 3% each, presentation 10%; key: >90%=A, >80%=B, >70%=C, >50%=D.

Class web site: http://www.astro.washington.edu/ivezic/Astr509

Textbook: Binney & S. Tremaine: *Galactic Dynamics*

Reference Book: Mihalas & Binney: *Galactic Astronomy*

Class Schedule

The numbers printed in **bold** refer to the textbook sections to be discussed in class. It is recommended that you read them prior to the lecture. The problem numbers, printed in *italics*, refer to homework assignments, and are due on the listed date. **PP** marks a paper presentation (20+10 min).

1. **Jan 4** Class Outline, Basic Model of the Milky Way (**1.1**)
2. **Jan 6** Potential Theory I (**2.1, 2.2**)
3. **Jan 11** **** No class – AAS meeting*
4. **Jan 13** **** No class – AAS meeting*
5. **Jan 18** Potential Theory II (**2.4, 2.6**) (*2.1*)
6. **Jan 20** Potential Theory III (**2.7, 2.8**) (*2.2*)
7. **Jan 25** Orbits in Static Spherical Potentials (**3.1**) (*2.3*) **PP**
8. **Jan 27** Orbits in Axisymmetric Potentials (**3.2**) (*3.1*) **PP**

9. **Feb 1** Equilibria of Collisionless Systems I (**4.1**) (*3.2*) **PP**
10. **Feb 3** Equilibria of Collisionless Systems II (**4.2**) **PP**
11. **Feb 8** *Midterm Exam*
12. **Feb 10** Equilibria of Collisionless Systems III (**4.3, 4.4**) (*4.9*)
13. **Feb 15** The Jeans Instability (**5.1**) (*4.10*) **PP**
14. **Feb 17** Disk Dynamics I (**6.1, 6.2**) **PP**
15. **Feb 22** Disk Dynamics II (**6.3**) (*5.1*) **PP**
16. **Feb 24** Disk Dynamics III (**6.4**) **PP**
17. **Mar 1** Collisons I (**7.1**) (*6.2*) **PP**
18. **Mar 3** Collisons II (**7.5**) **PP**
19. **Mar 8** **** No class – out of town*
20. **Mar 10** Kinetic Theory (**8.1, 8.2, 8.3**) (*7.3*)
21. **Mar 15** *Final (second midterm) Exam*

Selected Papers for Presentation:

pick one

1. Bahcall, J.N. & Tremaine, S. 1981, *Methods for determining the masses of spherical systems. I - Test particles around a point mass*, ApJ 244, 805
2. Dehnen, W. & Binney, J.J. 1998, *Local stellar kinematics from HIPPARCOS data*, MNRAS 298, 387
3. Heisler, J., Tremaine, S. & Bahcall, J.N. 1985, *Estimating the masses of galaxy groups - Alternatives to the virial theorem*, ApJ 298, 8
4. Helmi, A. & White, S.D.M. 2001, *Simple dynamical models of the Sagittarius dwarf galaxy*, MNRAS 323, 529
5. Ibata, R., et al. 2001, *Great Circle Tidal Streams: Evidence for a Nearly Spherical Massive Dark Halo around the Milky Way*, ApJ 551, 294

6. Jaffe, W. 1983, *A simple model for the distribution of light in spherical galaxies*, MNRAS 202, 995

7. Kuijken, K. & Gilmore, G. 1991, *The galactic disk surface mass density and the Galactic force K(z) at Z = 1.1 kpc*, ApJ 367, L9

8. Kuijken, K. & Tremaine, S. 1994, *On the ellipticity of the Galactic disk*, ApJ 421, 178

9. Navarro, J.F., Frenk, C.S. & White, S.D.M. 1996, *The Structure of Cold Dark Matter Halos*, ApJ 462, 563

10. Spitzer, L. & Schwarzschild, M. 1953, *The Possible Influence of Interstellar Clouds on Stellar Velocities. II*, ApJ 118, 106

11. Syer, D. & Tremaine, S. 1996, *Made-to-measure N-body systems*, MNRAS 282, 223

12. van den Bosch, F.C. & Dalcanton, J.J. 2000, *Semianalytical Models for the Formation of Disk Galaxies. II. Dark Matter versus Modified Newtonian Dynamics*, ApJ 534, 146