# Astronomy 753: Normal Galaxies and the Milky Way
Fall 2010

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**Class Times:**
GRS AS753: Tue, Thur: 9:30-11:00 (CAS 500)

**Office Hours:**
M:1-2, W:2-3, and by appointment

**Textbook:**
*Galactic Astronomy*, 1998, Binney & Merrifield

**Supplemental Reading:** I will supplement the textbook with chapters from *New Light on Dark Stars* - Reid & Hawley, *Galaxies in the Universe* - Sparke & Gallagher and a number of seminal papers that will aid in our exploration and discussion of galaxies. No need to buy these since I will photocopy the relevant chapters/sections for you.

**Web site:** I will have most of the course information available through the BU Blackboard site (http://blackboard.bu.edu). You will be able to log into the course site by logging into blackboard with your BU username and Kerberos password.

**Course Description and Goals:** Astronomy 753 is a post comps course designed to cover some of the highlights from the Milky Way *and* the extragalactic Universe. This class could easily take up 2 or 3 semesters but we have to do it in one (I promise). We will therefore focus on the aspects of galaxies (including ours) that I think are most important or that I would be embarrassed if you left BU without knowing. My goal is for us to engage in discussions and collaborative learning that I think will be beneficial to all of us (including me).

**Current Science/Astro-ph:** Most of you already spend some amount of time every day looking through astro-ph. For those who don't, it's time to start (you can get a daily email, RSS feed, etc.). As new papers that are related to the class content appear throughout the semester, we will add them to our reading or spend some time in class discussing some of the new results. Since I sometimes miss articles, please be ready to alert me (and the rest of the class) to relevant papers.

**Daily Order-of-Magnitude problems:** We will start (almost) every class with a 5-10 minute order-of-magnitude problem for you to solve both individually and/or in small groups. This is designed to help you hone your skills at thinking on your feet and assessing the validity of results and the feasibility of observations/experiments.

**Homework:** There will be $\sim$ 10 homework assignments that will be assigned/due roughly once per week for the first couple months of the class. I will try to keep the assignments to 1 or 2 problems that will focus on skills or concepts that are important/relevant to the material we are discussing at that time.

**Late Policy:** Homework will be not be accepted late. The main point of doing the assignments is to prepare you for class and give you a chance to delve more deeply into a specific topic.

**Leading Discussion:** Each student (including the auditors) will be responsible for leading discussion for 1 week during the semester. During his or her week, the "leader" will prepare handouts, write notes and think of questions and problems with which to present the class. I will also prepare my own notes for each class and will supplement the content provided by the student leader. I will be available to meet with each leader prior to the assigned week and will be the "leader" for the first week to give you all an example of what I expect. My hope is that by giving you ownership of your education, it will help contribute to more productive discussions and more educative class time.

**Projects:** Each student will be asked to write a short paper based on a project that he or she works on during the semester. I have a number of ideas for projects and will present them during the 3rd week of the semester. Even though I have a list of my own ideas for projects, I am open to students coming up with different/new suggestions - so start thinking. The projects should use real data (or theory) to explore some problem in Galactic or extragalactic astronomy. The projects can be executed in teams of 2 people, but each enrolled student will be responsible for turning in his or her own write-up at the end of the semester. More details about the projects will be presented in September.

**Important Dates**

- West in Seattle: 9/2 (no class)
- West in DC: 9/9 (no class)
- Monday schedule: 10/12 (no class)
- Fall Recess: 11/25 (no class)
- Last Day of Classes: 12/9
- Projects Due: 12/20

**Grading:**
Homework: 30%
Discussion Leading: 30%
Project: 25%
Participation/preparation: 15%

# Course Outline

| Week | Leader | Topic | Homework/Assignments | Reading |
|---|---|---|---|---|
| Pre-class: 8/10 | West | Introduction, syllabus, expectations | | |
| Week 1: 9/7 | West | Coordinate Systems, distances, observations biases, location and motion of the Sun | HW 1 due (9/7) | Ch. 1-2.2; Ch. 3.6.1-3.6.2 |
| Week 2: 9/14, 9/16 | Andersen | Photometric systems, large surveys: SDSS, UKIDSS, 2MASS, etc.; stellar populations; stellar spectra, stellar mass | HW 2 due (9/16) | Ch. 2.3,3.1-3.5, 5.1-5.2, 6 |
| Week 3: 9/21, 9/23 | Finn | Galactic structure, luminosity and mass functions of stars | HW 3 due (9/23) | T:10.1,10.4,10.5; Th: 3.6 |
| Week 4: 9/28, 9/30 | Morgan | Stellar kinematics, Oort constants, asymmetric drift, dynamical heating, stellar age | HW 4 due (9/30) | TBA |
| Week 5: 10/5, 10/7 | Danowski | Dust and gas in the Galaxy; star formation, Toomre criterion, Schmidt-Kennicutt law | Project abs. due (10/7) | TBA |
| Week 6: 10/14 | West | Chemical evolution of the Galaxy | HW 5 due (10/14) | TBA |
| Week 7: 10/19, 10/21 | Cashman | Galaxy classification; local group of galaxies | HW 6 due (10/19) | TBA |
| Week 8: 10/26, 10/28 | Madsen | Structure of nearby galaxies, Sersic profiles, galaxy photometry; galaxy rotation, dark matter, maximal disk methods | HW 7 due (10/28) | TBA |
| Week 9: 11/2, 11/4 | Pavel | Distance ladder; Tully-Fisher, Faber-Jackson, fundamental plane | HW 8 due (11/4) | TBA |
| Week 10: 11/9, 11/11 | Sturch | Integrated spectra, colors of galaxies, K-corrections, stellar masses; galaxy properties as a function of environment | HW 9 due (11/11) | TBA |
| Week 11: 11/16, 11/18 | Sanueza | Star formation indicators; gas/dust content of nearby galaxies; current N-body simulations | HW 10 due (11/18) | TBA |
| Week 12: 11/23 | West | Group meeting/project update | | TBA |
| Week 13: 11/30, 12/2 | Malmrose | Extragalactic metallicities (R32); chemical evolution through cosmic time; star formation through cosmic time | | TBA |
| Week 14: 12/7, 12/9 | Wing | Galaxy luminosity function and evolution thereof; M-sigma relation, nuclear clusters, AGN, feedback | | TBA |