

UNIVERSITY OF CALGARY  
DEPARTMENT OF PHYSICS and ASTRONOMY  
COURSE OUTLINE

1. **Astrophysics 401, The Theory of Relativity**

Lecture Section **L01**: MWF, 12:00-12:50, SS 117

**Instructor**, D. Leahy Office SB517 Tel. No., 403-220-7192 e-mail address leahy@ucalgary.ca Office Hours: MWF 13:00-13:50

Blackboard course name: Asph401

Departmental Office SB605, telephone no. 220-5385

2. **PREREQUISITES**: Astronomy 213 or Astrophysics 213, Physics 325, and Mathematics 349 or 351 or Applied Mathematics 307.

3. **GRADING**: The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments	20%
In-class tests (2)	20%
Final Examination	40% (To be scheduled by the Registrar)]

**There will be a final examination scheduled by the Registrar's Office. A passing grade on the final examination is required in order to pass the course.**

In Asph 401: Percentage grades will be given for all elements of term work and examinations. A weighted course percentage will be calculated for each student after the final exam is written. A table of conversion from final course percentage to final course letter grade will be given on the Asph 401 Blackboard site later in the term.

4. **Missed Components of Term Work**. The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in section 3.6: <http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html>. It is the student's responsibility to familiarize himself/herself with these regulations. See also <http://www.ucalgary.ca/pubs/calendar/current/e-3.html>.

5. **TEXTBOOK**: "Galaxies in the Universe: an Introduction", Sparke & Gallagher, Cambridge

6. **EXAMINATION POLICY**: Students are encouraged to read the Calendar, Section G, on Examinations: <http://www.ucalgary.ca/pubs/calendar/current/g.html>.

Department Approval \_\_\_\_\_ Date \_\_\_\_\_

7. **OTHER IMPORTANT INFORMATION FOR STUDENTS**:

(a) **ACADEMIC MISCONDUCT** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under K. Student Misconduct (<http://www.ucalgary.ca/pubs/calendar/current/k.html>) to inform yourself of definitions, processes and penalties

(b) **ASSEMBLY POINTS in case of emergency during class time**. Be sure to **FAMILIARIZE YOURSELF** with the information at <http://www.ucalgary.ca/emergencyplan/assemblypoints>.

(c) **ACADEMIC ACCOMMODATION POLICY**. Students with documentable disabilities are referred to the following links:  
Calendar entry on students with disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html>  
Disability Resource Centre: <http://www.ucalgary.ca/drc/>

(d) **SAFEWALK**: Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

(e) **FREEDOM OF INFORMATION AND PRIVACY**: This course will be conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, **students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page**. For more information see also <http://www.ucalgary.ca/secretariat/privacy>.

- (f) **STUDENT UNION INFORMATION:** VP Academic **Phone:** 220-3911 **Email:** [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca).  
SU Faculty Rep. **Phone:** 220-3913 **Email:** [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca) Website <http://www.su.ucalgary.ca/home/contact.html>.  
Student Ombudsman: <http://www.su.ucalgary.ca/services/student-services/student-rights.html>
- (i) **INTERNET and ELECTRONIC COMMUNICATION DEVICE Information.** You can assume that in all classes that you attend, **your cell phone should be turned off.** Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

## DETAILED COURSE SYLLABUS

Topics to be covered:

Stars and stellar spectra  
Stellar photometry and magnitude system  
The Milky Way  
Coordinate systems  
Galaxy photometry  
Galaxies in the expanding universe  
The pregalactic era  
Mapping the Milky Way  
The solar neighborhood  
Luminosity functions and mass functions  
Distances from kinematics  
Distances to star clusters  
Galactic rotation  
Gas in the disk  
Gas in the inner Galaxy  
Gravitational lensing  
The orbits of stars  
Two body relaxation  
Collisionless Boltzmann equation  
Mass density in the Galactic disk  
The local group  
Satellites of the Milky Way  
Dwarf spheroidals  
Local group spirals  
Formation of the local group  
Origin of heavy elements  
Dwarf galaxies in the local group  
Spiral and S0 galaxies  
Surface photometry of disk galaxies  
Observing the gas  
Gas motions and the masses of galaxies  
Tully-Fisher relation  
Spiral arms and galactic bars  
Bulges and centers of disk galaxies  
Groups of disk galaxies  
Galaxy collisions and mergers  
Elliptical galaxies  
Faber-Jackson relation  
Stellar populations and gas in ellipticals  
Dark matter and black holes  
Galaxy clusters  
Active galactic nuclei