

Syllabus: ASTR3800 Introduction to Scientific Data Analysis and Computing
D. Duncan Spring 2008

Week	Lecture Topics	Lab Topics	Readings (Taylor) and Homework
1 Jan 13-19	Importance of understanding errors. Proper reporting of experimental error. Examples of investigations where error analysis was critical: 1. Elements-from the Big Bang or not? 2. Spot cycles on other stars – periodic or not? Systematic and random errors. Calibrations, scale and zero pt. errors	Get accounts to work in cosmos lab. Introduction to Unix.	<i>Read Ch. 1 and 2</i> <u>Intro. to Unix handouts</u> (4) Molaro et al paper HW1 (HW out Wed; due the following Wed..)
2 Jan 20-26	Approximate error propagation Analytical treatment of errors vs. Monte Carlo simulations	Introduction to IDL. Data types. Running IDL. Use of arrays. Plotting. Filling arrays (findgen) How to get hardcopy. ('ps')	<u>Intro. to IDL handout</u> HW2 (2 weeks long) <i>Start Ch. 3</i>
3 Jan 27- Feb 2	IDL Programming Examples Start to discuss data distributions, parent and sample populations	Unix and IDL practice: calculating, counting, loops	Continue week 2 HW <i>Finish Ch. 3</i>
4 Feb 3-9	Data distributions: binomial, Poisson, Gaussian. Std. deviation of the mean.	Functions and procedures	<i>Read Ch. 4.</i> HW3.
5 Feb 10-16	More accurate analytical treatment of propagation of errors	Reading and writing data in IDL	<i>Read Ch. 5.</i> HW 4.
6 Feb 17-23	Sources of noise in astronomical observations: instrument, background, photon. CCD as an example.	Work with a CCD camera to generate and characterize data	Explore http://idlastro.gsfc.nasa.gov/ The IDL Astronomy User's Library
7 Feb 24- Mar 1	Feb 27 Midterm (15% of grade) Go over MT.	Continue to work with CCD.	<i>Read Ch. 6 and 7.</i>
8 Mar 2-8	Least squares fitting to a straight line. Chi squared test.		<i>Read Ch. 8. HW 5.</i>
9 Mar 9-15	Correlation. Least squares fit to polynomials.		<i>Read Ch. 9. HW 6.</i>
10 Mar 16-22	Goodness of fit tests. Chi squared and KS tests.	Work with Big Bang data.	<i>Read Ch. 12</i>
11 Mar 23-29	Spring Break	Spring Break	Spring Break

12 Mar 30 – Apr. 5	Time series fitting. Periodogram, Fourier Series, Fourier Transform.	Work with Orion young star data.	<i>Read “periodogram” paper</i> HW 7.
13 Apr. 6-12	Completion of functional fitting; review. Choose and plan your final project.		HW 8.
14-16 Apr. 13- May 1	Projects (25% of grade) Week 1 – proposal given to DD and Ok’d. Week 2 – progress report. End of Week 3 – project turned in.	Some suggested projects: Orion stellar rotation, Geoff Marcy planet detection data, simulation of escape of planet atmosphere, or of SIM targeting.....	
	Final (20% of grade)	To be determined, probably May 7 or 8.	Homework will be 40% of grade.