ASTR 301

The Dynamical Universe

Fall 2018 (Class #17554)
Mon/Wed 2:00 – 3:15 PM, LO 1124

Instructor: Prof Dr Wladimir Lyra
E-Mail: wlyra@csun.edu
Phone: 818.677.7464
Office: Live Oak, 1119-G
Office Hours: Mondays 3:30-4:30 PM

Preferred communication method: email.

Course description

Positional Astronomy, Planetary motion, Kepler laws, and Newtonian dynamics.

Course Objectives

Upon completion, the student will have a thorough understanding of astrometry and how to measure coordinates in the celestial sphere, as well as Kepler laws, and elements of Celestial Mechanics.

Course Prerequisites

MATH150b; PHYS 220a or PHYS 225. All pre-requisites will be strictly enforced. None of the pre-requisites can be taken concurrently with this course.

Expanded Course Description

Our knowledge of the heavenly bodies is based on collecting their radiation and understanding the dynamics that set them in motion. These observations give us three main information, the direction whence it came, the amount of radiation received, and its spectral energy distribution. The first is the realm of astrometry, the second is the branch of photometry, whereas the last is the science of spectroscopy. In this course we will cover astrometry in detail, followed by the causes of these motions.

Grading

The grade will range from 0 to 100, and then converted to letter format. Plus and minus grades (i.e. B+) will be used. *There is no curve*. The conversion is shown below.

A	95-100	C	70-75
A-	90-94	C-	68-69
B+	88-89	D+	66-67
B	80-87	D	55-65
B-	78-79	D-	50-54
C+	76-77	F	Below 50

Materials

- Scientific Calculator (or computer)
- **CSUN Canvas** will be used for lecture notes, pre-lecture check-points, in-class and group uploads

Milestones

Checkpoint – 10/22/18, 2:00-3:15 PM

Final Exam – 12/17/18, 3:00-5:00 PM.

The grade will consist of homework (HW), a checkpoint (CP), a midterm (MR) and final exam (FE). Your exam grade (EG) will be a weighted average of checkpoint, midterm and exam, with 50% of the grade being your best grade (G1), 30% being the 2nd best (G2), and 20% (G3) the worst grade.

$$EX = (0.5*G1 + 0.3*G2 + 0.2*G3)$$

There will be weekly or biweekly homework assignments. Each assignment is worth 100 points; the HW grade is $HM = (\Sigma_{i=1,n} HW^i)/n$, where HW^i is an individual homework assignment and n the number of assignments. The worst 2 homework grades will be dropped from the average.

Your final grade will be a weighted average, with 70% being the exams, and 30% the homework

$$grade = 0.7*EX + 0.3*HM$$

Late homework policy

If you are late with homework, your grade will be given by

$$HM^i(t) = HM^i_{orig} * \exp(-t/\tau)$$

where HM^i_{orig} is the grade your homework would be worth if turned in at the deadline, t is time past the deadline, and $\tau = 86400$ s. Late homework will only be accepted via email; the time t given by the time stamp in the email.

Topics to be covered

This is a **PRELIMINARY** list of the topics that will be covered. The list is **DYNAMIC** and *will* be updated as the course goes, based on how in-depth we decide to go on some topics and also the interest of the class.

Class #	Date	Topics
1	8/27	Syllabus and overall overview.
2	8/29	Celestial Sphere - Definitions
3	9/5	Coordinate Systems – Horizontal and Equatorial
4	9/10	Coordinate Systems – Hour and Ecliptic
5	9/12	Spherical Trigonometry - Fundamentals
6	9/17	Spherical Trigonometry - Conversions
7	9/19	Spherical Trigonometry – Longitude
8	9/24	Precession
8	9/26	**Checkpoint**
9	10/01	Planetary Motion - Elongation
10	10/03	Geocentric Parallax
11	10/08	Superior and inferior planets
12	10/10	Motion of the Earth - Aberration
13	10/15	Stellar Motion – Parallax
14	10/17	Proper Motion
	10/22	**-**
15	10/24	**Quiz**
16	10/29	Orbital Period – Finding Mars
17	10/31	Kepler's lab
18	11/5	Constructing Orbits
19	11/7	The orbit is an ellipse
20	11/14	Directed Study – The Sun is the focus
21	11/19	Equant model and Kepler's 2nd law
22	11/21	Time and area – Kepler's equation
23	11/26	Solution of Kepler's equation; Kepler's 3rd law

24	11/28	Gravity
25	12/3	Kepler's laws through gravity
26	12/5	Celestial Mechanics – Constants of motion
27	12/10	Celestial Mechanics – Types of orbit
	12/17	**Final exam.**

Course notes

Lectures will mainly be standard blackboard lectures with demonstrations, but slides, images, and videos will be used when appropriate. In such case, they will be posted on Canvas. The notes will be posted on Canvas, but students are encouraged to take their own hand-written notes to better follow the material.

Textbooks

The course will be taught from the instructor's lecture notes. While no book is officially used, classes may draw from

- *Fundamental Astronomy,* Karttunen, Kroger, Oja, Poutanen, Donner.
- *Solar System Dynamics* Murray & Dermott.

You do not need to buy any of these books as they will be made available to you at the Library.

Office hours

The office hours are on Mondays from 3:30pm to 4:30pm. Other times by appointment only, as I may have a meeting or be engaged elsewhere. If you are able to phrase/illustrate your doubt in a clear way in writing, you are welcome to reach me by email.

Student Responsibility

You, as the student, are responsible for all material presented in class and in assignments, and for any announcements made during class time (which may include changes to the schedule), whether you are present or absent. It is your responsibility to attend and keep up with the rhythm of the class.

Class attendance is essential for the understanding of the material. If you should decide to drop the class, you must do so before the deadline listed in the schedule of classes, or a grade will be assigned. Dropping the class is the student's responsibility, not the instructors.

Use of Laptop Computers & Mobile Phones

You may use a laptop computer in the classroom only for class purposes. You may not surf the web, play games, or engage in any activity, which I would consider disruptive to you, or students around you. Mobile phones must be turned to silent mode, and can only be used to participate in class. You may not use your portable phone in lieu of a scientific calculator.

Use of Listening, Video, or Other Recording Device

The use of any electronic listening, or recording devices by anyone in class are not permitted. If you need to use a recording device as an authorized disability accommodation, you must provide me with verification from the Disability Resources and Educational Services (DRES) prior to the use. The DRES office is located in Bayramian Hall, room 110 and can be reached at 818.677.2684.

Disability Accommodation Statement

If you have a disability and need accommodations, please register with the DRES office or the National Center on Deafness (NCOD). NCOD is located on Bertrand Street in Jeanne Chisholm Hall and can be reached at 818.677.2611. If you would like to discuss your need for accommodations with me, please contact me to set up an appointment.

Academic Dishonesty Policy

Violations of Academic Integrity include, but are not limited to: (1) cheating on an exam, (2) plagiarism, (3) working together on an assignment, paper, or project when the instructor has specifically stated students should not do so, (4) submitting the same piece of work to more than one instructor, (5) allowing another individual to assume one's identity for the purpose of enhancing one's grade (6) paying for any source to provide solutions to homework assignments. These are all grounds for failing as they violate academic integrity. Furthermore, all homework assignments and material given is copyrighted. Uploading it to the internet or reproducing it anywhere is violation of copyright law and therefore a crime. Cheating will result in a letter grade of "F" equivalent to zero points for that particular assignment and/or test, any previous assignments will be called into question, and may result in a final grade of "F" for the course. Dishonesty will be dealt with along the University's guidelines and reported to the office of Student Affairs.

Support Services for Students

- **Learning Resource Center**: http://www.csun.edu/lrc/, 818.677.2033, Bayramian Hall 408. The mission of the LRC is to enable students to improve their academic performance through a variety of learning programs including workshops, one on one and group tutoring, Supplemental Instruction classes and interactive subject area computer programs and videos. Students who use LRC learning programs will develop and strengthen their critical thinking skills, study strategies, writing skills and performance in subject matter courses.

- **Academic Advisement**: http://www.csun.edu/ugs/advisement.html. The college-based academic advisement centers are available to assist students in selecting courses and programs of study and in choosing or declaring a major or minor. Visit the website to locate the advising center for your major, or for undeclared majors.

- **University Counseling Services**: http://www.csun.edu/counseling/, 818.677.2366, Bayramian Hall 520. UCS provides resources and information to assist students in dealing with a variety of large and small psychological obstacles that may interfere with academic progress and/or relationship satisfaction. Services include individual, group and crisis counseling.

- **Center on Disabilities**: http://www.csun.edu/cod/studentservices.htm, 818.677.2684, Bayramian Hall 110. The Center on Disabilities serves students with a wide range of visible and hidden disabilities, in a confidential environment. Students are encouraged to meet with the professional staff and explore the services available to support their academic, career and personal goals. Discover accommodations and strategies for help with disabilities in an academic setting.

- **The Career Center**: http://www.csun.edu/career/students/, 818.677.2878, University Hall 105. Need some help in deciding on a career? Or do you know your career and need to meet employers? Perhaps your resume needs some sprucing up? The Career Center offers a variety of services for students, from those new to the University to those about to graduate into the world of work.

This syllabus may be subject to change.