Physics 384 – ASTROPHYSICS – Fall 2016

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PHYS 384. Astrophysics. 3 cr. Selected topics in areas of astrophysics including planetary physics, stellar physics, galactic and extragalactic astronomy, and cosmology. Prereq: 250 and 300, MATH 222 or cons instr.

Meeting rooms/times:
Lecture (A106 SCI): Tuesday, Thursday, and Friday 10:00-10:50 am

Office Hours:
I have scheduled five office hours weekly:
Monday 12:00 – 1:00 pm
Tuesday 12:00 – 2:00 pm
Wednesday 12:00 – 1:00 pm
Thursday 12:00 – 1:00 pm
(or anytime my office door is open)

Textbook: Introductory Astronomy & Astrophysics (4th Ed.) – Zeilik & Gregory

Other helpful supplemental textbooks (not required):
Astronomy – A Physical Perspective by Marc L. Kutner
An Introduction to Modern Astrophysics – Bradley Carroll & Dale Ostlie

Course website:
Desire to Learn (D2L) http://www.uwsp.edu/d2l/Pages/default.aspx
Log on using your UWSP login and password. *This website will be used for posting:*
- *grades for homework assignments and exams;*
- *class announcements; for example, change of due date for an assignment, comments on a homework problem, exam dates, etc.*

Major Goal: applying and understanding fundamental physics concepts to a series of astronomical phenomena

Attendance: Attending the lecture is **extremely important** given the nature of this course. All demonstrations and derivations will be written on the board. The material requires constant attention.

Grading Policies:
You will have the following contribution to your final grade:

Three (in-class) exams – each 17%
Homework assignments – 25%
Final exam (comprehensive; in-class) –24%

Your current grades will be posted periodically (updated typically every week) on the D2L class website. If you have any questions regarding the listed grades please contact me immediately, so that any errors can be corrected.
The final letter grade will be assigned according to the following scale:
A → 93-100% A- → 90-92.99%
B+ → 87-89.99% B → 83-86.99% B- → 80-82.99%
C+ → 77-79.99% C → 73-76.99% C- → 70-72.99%
D+ → 67-69.99% D → 60-66.99%
F → less than 60%

Exams:
Tentative dates for the midterm exams: October 4, November 1, and November 23
The final exam is scheduled for Friday, December 16th 8:00-10:00 am (Room A106 SCI)
All other in-class exams during the semester will be given during the regular lecture time (Room A109 SCI). The dates of the exams during the semester are subject to change and will be announced in-class at least one week in advance.

There are no make-up exams. *In the case of an unfortunate event (illness, death in the family, accident, etc.) please contact me* ***before the exam*** *(if at all possible) so that we could make proper arrangements. It is your responsibility to provide me with a valid doctor excuse for any illness that prevents you from fulfilling the requirements of this class.*

Homework Assignments:
I will assign homework approximately every week. The due date will be clearly stated for each assignment and strictly enforced. No assignment is accepted after the decided due date & time.

Disability Services:
Students with special needs should contact the Office of Disability Services as soon as possible (http://www.uwsp.edu/disability/Pages/default.aspx) in order to request suitable accommodation.

Academic misconduct: Students are expected to maintain the highest standards of academic integrity. Common examples of misconduct: copying the homework from others, talking to others while taking an exam, etc. Just to avoid the embarrassment of misconduct I would strongly advice that if you need some clarification during an exam or while working on homework, you should ask the instructor/proctor for help. More information on your rights and responsibilities are available at: http://www.uwsp.edu/stuaffairs/Documents/RightsRespons/Academic%20Integrity%20Brochure.pdf

Final note: Common courtesy dictates that students attending a class should remain seated for the duration of class. While in class students should refrain from using phones, music players, head phones, etc. and should also refrain from gossiping/chatting while the professor is lecturing and other students are listening and taking notes.

In case of emergency: http://www.uwsp.edu/rmgt/Pages/em/procedures/default.aspx

I am listing below some of the major (tentative) topics that we will cover in this course. The order is not necessarily accurate, nor complete. This course is not a survey of Astronomy. We will not cover the entire book.

TOPICS

- Planetary orbits: Kepler's Laws and their physical interpretation, Newton's generalization; the meaning of mass and weight, virial theorem

Applications: planetary systems, binary stars, objects around BH in galaxies, rings around giant planets etc.

- Escape speeds, circular speeds, closed and open orbits

Applications: Maxwell's distribution of particles in a gas; planetary atmosphere retention

- Temperature relation between a planet and its star
- Applications of Special and General Relativity
- Black Holes
- Tidal forces
- Methods of detecting exoplanets
- Properties of light: wavelength, energy, diffraction, interference, Doppler effect
- Telescopes: properties, ground and space-based observatories
- Celestial sphere: coordinates altitude-azimuth, RA-Dec, Galactic Coordinates
- Atomic structure: Bohr's model, ionization, Boltzmann and Saha equations
- Plank's radiation, Wien's and Stefan-Boltzmann's Laws, Stellar Spectra
- Properties of the Sun; the Sun as a prototypical star
- Stars: distances, magnitudes, luminosities, masses, sizes (radii)
- HR diagram, Mass-Luminosity relation, Binary Stars
- Star formation (virial theorem) and the physical laws of stellar structure and evolution
- Stellar remnants: white dwarfs, neutron stars (physics of degenerate matter), pulsars, black holes
- Variable stars – distance to MW's center using P-L relation for Cepheid variables
- Interstellar reddening and absorption
- Galactic Rotation: stellar motions
- Structure of Milky Way

- Photometry of galaxies; properties of bulges, disks, bars
- Classification of galaxies: Hubble and others (de Vaucouleur, Kormendy & Bender, etc.)
- Tully-Fisher Relation
- Active Galaxies: superluminal motion, quasars
- Methods of determining (supermassive) black hole masses in galaxies
- Dark Matter – evidence
- Hubble Law and the expanding Universe