

**TEXT:** **FOUNDATIONS OF ASTRONOMY, WSU Edition** by Michael A.

Seeds and Dana E. Backman (Brooks/Cole Cengage, 2013)

**LECTURE:** M W 5:30 – 7:20 p.m.

**LOCATION:** 150 General Lectures Bldg.

**LECTURER:** ELISABETH ATEMS

**OFFICE:** 233 Physics Research Bldg. (666 W. Hancock)

**E-MAIL** (preferred method of contact): elisabeth.atems@wayne.edu

**OFFICE HOURS:** to be announced (by September 6)

**LECTURE & READING ASSIGNMENTS:** In order for you to appreciate, learn from, and participate in the discussion of material covered in each lecture, it will be very important for you to come to lecture prepared by having read and tried to understand the reading assignment for each lecture. Reading assignments for each week will be posted on Blackboard. You therefore need access to a computer. If you do not own a computer, the undergraduate library has a computer lab for you to use or you can use computers available at every public library. The lecture notes will also be available on Blackboard; I will try to post them as soon as possible after each class.

**CLICKER QUESTIONS:** During class I will frequently pose questions and ask you to answer via the use of i>clickers. The main reasons for doing this are to encourage you to actively think about the material during class, and to let me know as quickly as possible how well you are understanding the lecture. They are NOT primarily a testing tool. To encourage your attendance and participation, clicker questions will count as 10% of your final grade. However, only a fraction of that credit will depend on correct answers.

**HOMEWORK:** To aid in your studying and self-assessment, a homework set consisting of from 8 to 14 multiple choice and true/false questions will be posted every week on Blackboard. These questions will typically be on material covered in class during the preceding week. The questions are drawn at random from a large question bank. Since they will NOT count toward your grade, you may access and even retake these assignments at any time. However, you are encouraged to try them as soon as possible after encountering the material.

**OTHER ASSIGNMENTS:** There will also be two scheduled planetarium visits during the term. THESE VISITS ARE A REQUIRED PART OF THE COURSE and count for 5% of your grade. The WSU planetarium is in the basement of Old Main Building; see <http://planetarium.wayne.edu> for details and for links to the schedule. There will be quizzes on each of the planetarium visits for extra credit (each worth 2.5%). There may also be other assignments for extra credit during the term such as bonus questions on exams.

**EXTRA CREDIT:** Extra credit raises the maximum possible percentage to over 100%. Since your final grade is based on a straight scale, extra credit can only raise your overall class standing, it cannot lower it.

**PERFORMANCE EVALUATION:**

|                                   |                                     |
|-----------------------------------|-------------------------------------|
| 3 partial exams (lowest dropped): | 45% - Each partial counts for 22.5% |
| Final exam:                       | 40%                                 |
| Clicker questions:                | 10%                                 |
| Planetarium attendance:           | 5% - Each show counts for 2.5%      |
| Total regular credit:             | 100%                                |
| Planetarium Quizzes Extra Credit: | 5% - Each quiz counts for 2.5%      |

**FINAL GRADES:**

|    |              |
|----|--------------|
| A  | $\geq 90 \%$ |
| A- | 85 - 89      |
| B+ | 80 - 84      |
| B  | 75 - 79      |
| B- | 70 - 74      |
| C+ | 65 - 69      |
| C  | 60 - 64      |
| C- | 55 - 59      |
| D+ | 50 - 54      |
| D  | 45 - 49      |
| D- | 40 - 44      |
| F  | $< 40$       |

**TO GET A GOOD GRADE**

- Purchase the book: it is sold at Barnes and Noble Bookstores and used copies may be available. The book is **required**.
- Do the reading assignments and all of the homeworks.
- Come to class! Research has shown that students who come to class do better, on average, than those who do not.
- Even though your lowest partial exam score will be dropped, you should not skip an exam because you feel it won't affect your grade. **IF YOU MISS MORE THAN ONE EXAM YOU WILL RECEIVE A GRADE OF F** regardless of your class standing otherwise. **NO EXCEPTIONS.**
- You cannot skip the final exam because you feel you are getting a good enough grade even without it. **IF YOU MISS THE FINAL EXAM, YOU WILL RECEIVE A GRADE OF F. NO EXCEPTIONS.**
- A makeup exam **MAY** be allowed (one time only) in case of medical emergency or death of a close relative, **NOT** for travel out of town or prior commitment. Documentation will be required before a makeup exam will be scheduled.

| Week | Day | Date  | Lecture Topics  | Reading                 |
|------|-----|-------|---|-------------------------|
| 1    | W   | 8/28  | The sky, the Celestial Sphere, cartography of Earth and sky; measuring distance and size in astronomy; apparent motion of planets and ancient models of the Solar System.   | (Chapter 1,) 2.1 – 2.11 |
|      | W   | 9/4   | The Copernican Revolution and the birth of modern astronomy; Tycho Brahe's observations, Kepler's laws, Galileo's discoveries; Newton's laws of motion, gravity, orbital motion. Stellar aberration and parallax. | 3.1 – 3.6               |
| 2    | M   | 9/9   | Cycles of the Sun and planets; Earth's axial tilt and the seasons; measuring time and calendars; precession. The Moon: its motion and phases.   | 4.1 – 4.5               |
|      | W   | 9/11  | Solar and lunar eclipses. Gravity revisited: mutual gravitation, orbital motion and tides; orbital and escape velocities; Kepler's laws re-examined.  | 4.6, 5.1 – 5.2          |
| 3    | M   | 9/16  | Einstein and Relativity. Light and radiation, light as wave and particle; the electromagnetic spectrum. Telescopes, powers and limitations: refractors and reflectors; collection, resolution, magnification.     | 5.3, 6.1 – 6.2          |
|      | W   | 9/18  | Telescopes on Earth and in space. Astronomical instruments and techniques. Atoms and electronic orbits; interactions of light and matter; emission and absorption of light; blackbody radiation.                  | 6.3 – 6.5, 7.1 – 7.2    |
| 4    | M   | 9/23  | Atomic spectra; Kirchhoff's laws; the Doppler effect. The Sun: the solar atmosphere; solar activity and the Sun's magnetic cycle; solar magnetic phenomena and their effect on Earth.                             | 7.3, 8.1 – 8.2          |
|      | W   | 9/25  | Nuclear fusion in the Sun. The solar neutrino problem. Stellar distances: triangulation and parallax; proper motion.  | 8.3, 9.1                |
| 5    | M   | 9/30  | <b>First Partial Exam</b>   |                         |
|      | W   | 10/2  | Brightness, distance, and luminosity; apparent and absolute magnitudes. Stellar spectra and spectral types. Stellar sizes and the H-R diagram.  | 9.2 – 9.4               |
| 6    | M   | 10/7  | Stellar masses; visual and spectroscopic binaries. Eclipsing binaries. The Main Sequence and the mass-luminosity relation. The interstellar medium; emission and reflection nebulae.                              | 9.5 – 9.6<br>10.1       |
|      | W   | 10/9  | Stellar formation: protostars and protostellar disks. Stellar structure and stability: hydrostatic equilibrium. Fusion inside stars: the p-p chain, the CNO cycle, and the pressure-temperature thermostat.       | 11.1 – 11.5             |
| 7    | M   | 10/14 | Stellar evolution and the main sequence. Evolution after the main sequence. Evidence for evolution: star clusters and variable stars.   | 12.1 – 12.4             |
|      | W   | 10/16 | The deaths of stars: low mass stars, planetary nebulae and white dwarfs; binary stars, mass transfer and accretion disks, nova explosions.  | 13.1 – 13.2             |
| 8    | M   | 10/21 | Massive stars and supernova explosions; types of supernovae. Neutron stars and pulsars; black holes.  | 13.3, 14.1 – 14.2       |
|      | W   | 10/23 | The Milky Way Galaxy: its size, structure, and mass; spiral arms and nucleus.   | 15.1 – 15.4             |

|    |   |       |  |                            |
|----|---|-------|--|----------------------------|
| 9  | M | 10/28 | <b>Second Partial Exam</b>   |                            |
|    | W | 10/30 | Origin and history of the M.W. and stellar populations. Theories of galactic formation. Properties of galaxies: distance, size, mass. Supermassive black holes and dark matter.            | 15.5, 16.2                 |
| 10 | M | 11/4  | Active galactic nuclei: Seyfert galaxies, quasars; supermassive black holes. Cosmology and the Big Bang Theory.  | 17.1 – 17.2<br>18.1 – 18.2 |
|    | W | 11/6  | The Cosmic Microwave Background; nucleosynthesis; the cosmic redshift; dark matter in cosmology; inflation, expansion, and acceleration: dark energy and the age and fate of the universe. | 18.3 – 18.4                |
| 11 | M | 11/11 | The Solar System: its structure, origin, and evolution. Planet building. Extrasolar planets.   | 19.1 – 19.4                |
|    | W | 11/13 | Comparative planetology. The Earth as a planet: its interior, crust, magnetic field, atmosphere and climate. The Moon: its surface, geology, history and origin.                           | 20.1 – 20.4<br>21.1        |
| 12 | M | 11/18 | Mercury: its rotation and revolution, surface, interior, and history. Venus: its atmosphere, surface, geology, rotation, history. Mars: its atmosphere, geology, history, and satellites.  | 21.2, 22.1 –<br>22.3       |
|    | W | 11/20 | Jupiter and Saturn: their atmospheres and interiors, satellites and rings, and history.  | 23.1 – 23.5                |
| 13 | M | 11/25 | <b>Third Partial Exam</b>  |                            |
|    | W | 11/27 | <b>Thanksgiving Holiday</b>  |                            |
| 14 | M | 12/2  | Uranus and Neptune: their discoveries, motions, atmospheres and interiors; satellites and rings. The Kuiper belt and the outer Solar System: Pluto and dwarf planets.                      | 24.1 – 24.3                |
|    | W | 12/4  | Meteoroids and meteorites. Asteroids, comets, and impacts.   | 25.1 – 25.4                |
| 15 | M | 12/9  | Astrobiology: origin of life, evolution of life on Earth; life elsewhere, intelligent life and SETI.   | 26.1 – 26.3                |
|    | M | 12/16 | <b>Final Exam (cumulative)</b>   |                            |

Note: This schedule is subject to change, except for dates of exams. The exact reading assignments for each lecture will always be given on the Blackboard course page at <http://blackboard.wayne.edu/>. Lecture slides for each covered unit are on Blackboard and on the course website: <http://ast2010.physics.wayne.edu/AST2010/>.