

Moravian College Astronomy—EASC-130

Fall/Spring Term 2013/14—Tuesdays/Thursdays 6:30 p.m. to 9:30 p.m.

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Moravian astronomy classes meet in the Astronomy/Geology lab, Room 106, in the basement of the Collier Hall of Science.

Required Texts: ^{Becker's} *Astronomy Survival Notebook* (BASN)... *Universe: The Definitive Visual Guide* (UDVG), General Editor, Martin Rees, and a reading manual (RM) containing Xeroxed articles... Lender copies of each text will be supplied by your instructor at no cost. The *Astronomy Survival Notebook* is your main textbook and it is yours to keep. The reading manual is also yours to keep if you wish. *Universe* is for supplemental reading assignments and may not be marked up in any way.

Students will always bring to class their Astronomy Survival Notebook, a calculator, a flashlight and a Smart/Cell Phone. Your smart phone may be substituted for a calculator (non-exam situation), as well as a flashlight. *Universe: A Definitive Visual Guide* and the **reading manual** do not have to be brought to class. If you own or can borrow binoculars, bring them to class on nights when observing will take place. Please do not buy binoculars for this class.

About this Syllabus: Consider this syllabus an evolving/working document helping to keep you and your instructor on track. There will be changes. Be more aware of the classes (CI) than the dates. The class numbers will be the order of my presentations. Planetarium programs will most likely fall on the indicated dates unless inclement weather causes problems.

Date	CI	Topics of Discussion	Texts: BASN/UDVG/RM
Aug. 27, 2013	1 Tu	Getting Started: Course Syllabus and class routine, use of BASN, presentation on www.astronomy.org , What is Astronomy? Distill the word to its basic meaning.	1-Borrow binoculars if you do not already own one. Do not buy binoculars.
Aug. 29, 2013	2 Th	Popular Misconceptions: Five areas of focus in astronomy, Harvard University's Misconceptions Test (for fun), test explanation, Astrology vs. Astronomy; Inverse Square Law, Test Your Visual Knowledge of Astronomy exercise.	2-BASN: Session 2: Popular Misconceptions in Astronomy UDVG: pp 6-7.
Sept. 3, 2013	3 Tu	Popular Misconceptions: EARTH, SUN, MOON RELATIONSHIPS. Understanding the Seasons (various demonstrations/teacher and students), Geometry of the Seasons lab completed in class. Traditions of the Sun web assignment. Vocabulary quiz	3-BASN: Session 2 and 3 Appendix , pp. 555-562 RM: A Sky for all Seasons Session one vocabulary quiz
Sept. 5, 2013	4 Th	At the Boyertown Sch. Dist. Planetarium: CLASS WILL RUN FROM 7-9 P.M. Students carpool. See map. Know where your team's pickup point is located. Give yourself at least an hour to get to the planetarium. Maps are provided. EARTH, SUN, MOON RELATIONSHIPS. Introduction to the planetarium environment, seasonal effects from home and different latitudes, lunar phases, north circumpolar constellations.	4-UDVG: Constellations, pp. 328-480 (N. Hem. Only), Skim through some of the major constellations and enjoy. One hour. BASN: Read Appendix, pp. 555-562

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
Sept. 10, 2013	5 Tu	Popular Misconceptions: EARTH, SUN, MOON RELATIONSHIPS. Seasons Lab: Students show graphically what they saw with respect to seasonal effects from different latitudes at the planetarium and attempt to answer questions pertaining to the altitude graphs they have constructed. Equatorial Coordinate System Lab: Pupils locate current positions of planets, sun, and moon in the sky or plot a month of lunar position to become familiar with right ascension and declination.	5-UDVG: View from Earth, pp. 56-91. Read seriously. BASN: Session 2, especially A Brief Review of Coordinate Systems. RM: A Sky for all Seasons.
Sept. 12, 2013	6 Th	Popular Misconceptions: EARTH, SUN, MOON RELATIONSHIPS. Seasons lab questions discussed in class. Phases of Moon: phases in correct order, students demonstrate phases with moon on a stick, phase worksheet, identify the phase at your birth, sample phases of the moon quiz, moon illusion, blue moon. Traditions of the Sun web assignment handed in.	6-UDVG: View from Earth, pp. 56-91. Read seriously. BASN: Session 2, Read vocabulary list Session 3. RM: A Sky for all Seasons.
Sept. 17, 2013	7 Tu	Archaeoastronomy: Save Your People, Win That Girl completed in class, team examples of calendar construction are given, Video: The Mystery of Chaco Canyon to introduce archaeoastronomy.	7-BASN: Session 3: RM: A Sky for all Seasons.
Sept. 19, 2013	8 Th	At the Boyertown Sch. Dist. Planetarium: Students carpool in teams. Some seasonal constellations. Stonehenge decoded, Coordinate Systems: Altitude and azimuth, latitude and longitude, equatorial coordinate system, precession, time, celestial navigation lab introduced, constellations if time permits.	8-BASN: Session 2 and 4 UDVG: Constellations, pp. 328-480 (N. Hem. Only), Skim for an hour and enjoy.
Sept. 24, 2013	9 Tu	Archaeoastronomy-PowerPoint: Focusing on Chaco Culture —Pueblo Bonito and A Picture is Worth 1000 Words exercises. The Mystery of Chaco Canyon , concluded, if time permits.	9-BASN: Session 5, get familiar with eclipse vocabulary. Eventually there will be a vocabulary quiz.
Sept. 26, 2013	10 Th	At the Boyertown Sch. Dist. Planetarium: Lunar and Solar Eclipses Students carpool in teams. Basic eclipse terminology, repetition of eclipses, the saros, demonstrations of parameters which influence eclipses, chasing eclipses, planetary motions, and configurations, constellations. Video: The Great Eclipse , 25 minute segment leading up to and through totality.	10-BASN: Session 5 RM: Aspects and Motions of the Moon; Eclipses.
Oct. 1, 2013	11 Tu	Celestial Navigation Lab: Students find their location on the Earth's surface using the stars, the equatorial coordinate system, and the sidereal time at Greenwich. Students will complete two navigational exercises. Bart's quiz on telescopes will end the lesson. Eclipse Vocabulary Quiz	11-BASN: Session 13-14 UDVG: pp. 120-123. pp, 230-261.

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
Oct. 3, 2013	12 Th	Telescopes: Make a drawing through a telescope and analyze your experiences. The physics of light, as it applies to telescopes. The telescopes of Galileo and Newton.	12-BASN: Session 6 RM: Telescopes in General and Telescopes in Particular
Oct. 8, 2013	13 Tu	Telescopes and the Universe: Different types of telescopes, economizing the size of telescopes, identifying different types of telescopes. “400 Years of the Telescope” video. Class takes a look at the evolution of the telescope with emphasis given to the history of astronomy and the contributions that the telescope has made to the science. The video will be used as a moving PowerPoint presentation. Exam review questions distributed. Mid-term grades	13-BASN: Session 6 RM: Telescopes in General and Telescopes in Particular
Oct. 10, 2013	14 Th	EXAM ONE on lessons 1-13: View From the Earth. The exam weight will be equal to approximately 65 points. Student driven review for the first hour of class, two-hour exam. Students may stay longer. Students will have received a study sheet for the exam at the end of the previous class.	14- Review necessary material in texts. Write out questions for discussion.
Oct-12- Oct-16, 2013		F A L L B R E A K ! No class on Oct. 15, 2012	FALL BREAK
Oct. 17, 2013	15 Th	Catch up time: This is an experiment. THERE WILL BE CLASS	TBA
Oct. 22, 2013	16 Tu	At the LVAAS Planetarium: Students carpool in teams. The evening at the LVAAS Planetarium will deal specifically with the constellations and the nighttime sky and other presentations that were not completed because of time constraints. Concluding remarks on telescopes. Spectroscopy demonstration. Aligning a telescope to the equatorial coordinate system may be considered. Directions to the Lehigh Valley Amateur Astronomical Society, Inc. are included in Student Information section of your book..	16-UDVG: Constellations, pp. 328-480 (N. Hem. Only), Skim through some of the major constellations and enjoy. Give yourself an hour for this assignment.
Oct. 24, 2013	17 Th	Dark Sky Observing at Bill Jacobs’s Farm, Ghost Mountain: Lessons nine and ten could be reversed depending upon weather conditions. Arrive at the farm no later than (see below). Dress Warmly! Bring binoculars if you have them. Constellations, view deep sky objects with telescopes, we’ll may also calculate the number of stars visible from Bill’s farm. Primary: Th., October 24—arrive, 6:15 pm Secondary: Tu., October 29—arrive, 6:15 pm Th., October 31—arrive, 6:15 pm Tu., November 5—arrive, 6:30 pm Th., November 7—arrive, 6:30 pm	17-BASN: Session 16 UDVG: Constellations, pp. 328-431 (N. Hem.), skim, enjoy—repeated from Jan. 28 readings Class starts at 6:15 pm reflect allow students to arrive in twilight. This will not be the case on Nov. 5 and 7. Students will arrive in the dark.

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
Oct. 29, 2013	18 Tu	Characteristic of Stars: Basic characteristic of main sequence stars, apparent and absolute magnitudes, parallax, calculating distances from parallax angles, distance unit of the parsec, parallax labs, distance modulus demonstrated. Quiz on Session 14 vocabulary.	18-BASN: Session 14 Quiz on Vocabulary
Oct. 31, 2013	19 Th	The Nature of Light: Descriptions of the electromagnetic spectrum (refection, refraction, dispersion, diffraction, and, interference), Doppler shift, black body radiation curves, colors of stars, Wien's and Steffan's laws, Kirchhoff's laws, the Bohr atom, Moravian campus tour viewed through "fireworks" glasses.	19-BASN: Session 14 UDVG: Milky Way, Stars 224-231
Nov. 5, 2013	20 Tu	Spectral Classification: (two labs) Fluorescence Spectroscopy Lab. and element identification quiz. Absorption spectrum lab, This lesson clarifies the "x" axis of the Hertzsprung Russell Diagram	20-BASN: Session 14 UDVG: MW, pp. 232-269.
Nov. 7, 2013	21 Th	Construction of a Hertzsprung-Russell Diagram: (lab) Students will construct an accurate color-coded representation of an H-R Diagram from the 30 brightest and the 30 nearest stars seen from the Earth and make some basic conclusions	21-BASN: Session 14 UDVG: MW, pp. 232-269.
Nov. 12, 2013	22 Tu	Stellar Evolution and the H-R Diagram: What does an H-R diagram tell us about how stars get born, live out their lives and die How can H-R diagrams allow us to understand stars too distant to measure their parallax or the age of star clusters, or why a star is variable?	22-BASN: Session 14 UDVG: MW, pp. 270-291
Nov. 14, 2013	23 Th	Comets and Other Small Solar System Bodies: In anticipation of the appearance of Comet ISON during the Thanksgiving Break we will talk about comets and their relationship to other small solar system bodies. Lab Demonstration: Make a Comet from scratch.	23-BASN: Session 12 UDVG: pp. 206-223
Nov. 19, 2013	24 Tu	Introduction to the Solar System: Definition of selective vocabulary words, graphical understanding of SS characteristics, SS characteristics, Invasion of the Sarbra People lab, Kepler's three laws of planetary motion, ellipse lab—sketch an orbit, angular momentum, universal gravitation (ellipses).	24-BASN: Session 7, review insert section. UDVG: SS, pp. 114-119. RM: Nine Planets
Nov. 21, 2013	25 Th	Introduction to the Solar System: Universal gravitation, magnetic fields, volatile versus refractory materials, stellar birth (quick review), a possible sequence of events for the origin of the solar system, meteoritic science, calculating the mass of Jupiter.	25-BASN: Session 7, review insert section. UDVG: SS, pp. 114-119. RM: Nine Planets
Nov. 23, Dec. 2, 2013	All Wk	THANKSGIVING BREAK!	THANKSGIVING BREAK

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
Dec. 3, 2013	26 Th	Comparative Planetology—The Moon: Survival on the Moon, formation and evolution of the moon, lunar physical features, how the moon changes, Apollo: when we went to the moon if time permits.	26-BASN: Session 9, review questions. UDVG: SS, pp. 148-159.
Dec. 5, 2013	27 Th	Mars: Explore Mars with a computer, physical features via remote sensing of the planet's surface, evidence for past and present water on Mars; Spirit, Opportunity, and Phoenix, and the Mars Science Laboratory Curiosity make their marks.	27-BASN: Session 10, review questions. UDVG: SS, pp.160-175.
Dec. 10, 2013	28 Th	SECOND EXAM on lessons 15 through 26: Same weight as the first exam (50 points) if there are only two exams. Student driven review for the first hour of class, two-hour exam limit. Class period starts at 6:30 p.m.	Happy Holidays Happy Summer! WE MADE IT!

COURSE OBJECTIVES:

1. To provide students with an accurate up-to-date informational portrait of the science of astronomy.
2. To show the validity of the process of science in problem solving situations.
3. To demonstrate the interdisciplinary nature of astronomy as it relates to other branches of science, mathematics, and the humanities.
4. To provide students with the opportunity to become familiar with the many facets of the night sky through planetarium demonstrations, computer simulations, and real time observations of the night sky.
5. To provide the type of classroom experience in which a nonscience oriented individual feels that he or she has the opportunity to succeed.

Course Objectives from the Previous Instructor, Dr. Joseph Gerencher... Students will understand the basic elements of time, date, seasons, positional coordinates, and observed celestial motions, the appropriate methods by which celestial objects and systems are observed, studied, presented, and analyzed, the use of the telescope [and binoculars] for making astronomical observations, a reasonable sense of scale concerning sizes, distances, brightness, masses, speeds, forces, and processes application of appropriate fundamental scientific principles to study celestial objects and systems, and the interaction and evolution of celestial objects and systems through time. *Kindly consider these also. Gary A. Becker*

Determination of Grades: Refer to ^{Becker's} **Astronomy Survival Notebook**, pp. xvii-xviii. Moravian's +/- grading policy will be adhered to as noted below:

	A =>93%,	A- =>89.5%<93%,
B+ <89.5%=>87%,	B <87% =>83%,	B- =>79.5%<83%,
C+ <79.5%=>77%,	C <77% =>73%,	C- =>69.5%<73%,
D+ <69.5%=>67%,	D <67% =>63%,	D- =>59.5%<63%,
F <59.5%		

Students always have a right to know their grades. Grades will normally be available for inspection prior to or after class. Grades will never be posted.

Participation: If you have a question and do not ask it, you do yourself and me a disservice. Your chances of learning specific concepts are diminished, and I get a false sense of accomplishment, neither of which is good. **Your participation is genuinely encouraged and it will be rewarded in your grade.** It becomes boring if information is flowing from only one direction. STUDENTS HAVE A RESPONSIBILITY TO HELP TO KEEP CLASSES INTERESTING AND DYNAMIC. This will also help me to achieve at my greatest potential.

Attendance Policy: **Students will sign in when they arrive to class.** Students are expected to be in class on time (6:30 p.m.), in a state of preparedness, and attend all classes. Students will receive a bonus of 10 points if they are present for all classes. Excused absences will receive a bonus deduct of four points for the first absence and three points thereafter until zero is attained. **There will be no exceptions.** Pupils who receive an excused absence will be expected to provide legitimate, documented proof about why they were absent to avoid penalty. The excuse must be valid for the day(s) of absence. **If you skip class after the break, or before an observing session,** I'll consider your absence unexcused for the entire class period. A penalty structure for unexcused absences will be as follows:

Classes Missed:	0	1	2	3	4	5	6	EVENT	7	BLACK HOLE
Reward/Deduct:	+10	-1 +	-2 +	-4 +	-8 +	-16 +	-32 +	HORIZON	-64	OF DEATH
Total Penalty Applied	-1	-3	-7	-15	-31	-63			-127	--YOU FAIL--

Academic Honesty Policy: This will be followed as per the Moravian College Catalog and online resources at, <http://www.moravian.edu/studentlife/handbook/academic/academic2.html>. Put in very plain English... If you cheat and you get caught you will fail the exam or maybe even the course. You may even be forced by Moravian College to change your major.

Learning Disabilities: Students who wish to request accommodations in this class for a disability should contact Elaine Mara, assistant director of learning services for academic and disability support at 1307 Main Street, or by calling 610-861-1510. Accommodations cannot be provided until authorization is received from the Academic Support Center.

Laptops are not permitted in class unless permission is given to use them by your instructor.

Smart/Cell Phone Policy: **Please silence your smart/cell phone when in class** unless you are using it for an astronomy related activity. Using a smart phone in class to look up information pertinent to the ongoing discussion, or as a calculator in a non-testing situation is permitted. Emergencies do happen, so if you absolutely need to use your phone for a private communication during class, kindly inform your instructor about this situation and leave the classroom to make your call. **I consider text messaging during class time rude behavior, and I may ask you to leave the room for the remaining duration of the lesson.** During non-testing breaks, cell phone use is always permitted. **Consider the educational process to be similar to live theater. The actors and audience need to communicate with each other in order to fully understand the plot.**

Electronic Recordings of Class Presentations Unless Specifically Approved by Administration are not permitted, and violators will be prosecuted within the guidelines of the Moravian College Code of Conduct.

Food: Class time is not mealtime. Please keep snacking to a minimum unless it is a medical necessity. The preferred drink of choice is water, but I will be a little more tolerant here. If you make a mess, please be considerate of others and clean it up!

Astronomical Observation Sessions: Quite frequently when the weather permits, class observations will be made from the Collier Rooftop Observatory. At least one field experience will be devoted to observing the heavens from a dark site. Conditions can be windy and cold especially during late fall, winter, and early spring. On clear nights, students should bring to class the extra protection needed for the head and hands in addition to normal winter clothing worn during the cold season.

AND THE REST WE'LL MAKE UP AS WE GO ALONG... (If necessary)