

Moravian College Astronomy—Spring Term 2014

Mon./Wed. (EASC-130 PN) and Tues./Thurs. (EASC-130 PM), 6:30 p.m. to 9:30 p.m.

Instructor: Gary A. Becker; **Phones:** Cell-610-390-1893 / Moravian-610-861-1476

Office: 113 Collier—Mon./Wed. and Tues./Thurs. 6 pm/or by appointment; office or astronomy lab

E-mail: garyabecker@gmail.com or garyabecker@moravian.edu

Web Page: Moravian College Astronomy, www.astronomy.org

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 the latter two texts will be supplied by your instructor at no cost. *Becker's Astronomy Survival Notebook* will cost \$25 and is your main textbook. Checks will be made payable to Moravian College Astronomy Program. *Universe: A Definitive Visual Guide* and the reading manual are for supplemental 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 situations), 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.

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. An **underlined date** indicates Mon.-Wed./Tues.-Thurs. classes will be combined on one of those two dates or there is a planned field trip.

Date	CI	Topics of Discussion	Texts: BASN/UDVG/RM
----- <u>Jan. 13,</u> <u>Jan. 14,</u> <u>2014</u>	1 M 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.
----- <u>Jan. 15,</u> <u>Jan. 16,</u> <u>2014</u>	2 W Th	Areas of Interest/Popular Misconceptions: Five areas of focus in astronomy, Test Your Visual Knowledge of Astronomy exercise. Harvard University's Misconceptions Test (for fun), Astrology vs. Astronomy; Inverse Square Law, Vocabulary quiz	2-BASN: Session 2: Popular Misconceptions in Astronomy UDVG: pp 6-7.
----- <u>Jan. 20,</u> <u>Jan. 21,</u> <u>2014</u>	3 M 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 discussed.	3-BASN: Sessions 2 and 3 RM: A Sky for all Seasons
----- <u>Jan. 22,</u> <u>Jan. 23,</u> <u>2014</u>	4 W Th	BOTH CLASSES at the Kutztown University Planetarium: CLASS FROM 7-9 P.M. Maps in Student Section of <i>BASN</i> . Know your teams' pickup location. Give yourself one hour to get there. EARTH, SUN, MOON RELATIONSHIPS. Introduction to the planetarium environment, seasonal effects from home and around the world, lunar phases, coordinate systems, north circumpolar constellations and more.	4-UDVG: Constellations, pp. 328-480 (N. Hem. Only), Skim through some of the major constellations and enjoy. One hour. BASN: Read Appendix, pp. 637-to end

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Jan. 27, Jan. 28, 2014	5 M Tu	Popular Misconceptions: EARTH, SUN, MOON RELATIONSHIPS. Phases of Moon: put 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. 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. Other misconceptions discussed.	5-UDVG: View from Earth, pp. 56-91. Read seriously. BASN: Session 3, especially A Brief Review of Coordinate Systems. RM: A Sky for all Seasons.
----- Jan. 29, Jan. 30, 2014	6 W Th	Popular Misconceptions: EARTH, SUN, MOON RELATIONSHIPS. Seasons lab questions discussed in class. Traditions of the Sun web assignment handed in. Equatorial Coordinate System Lab: Pupils locate current positions of planets, sun, and moon in the sky or plot a month of lunar positions to become familiar with the equatorial coordinate system of right ascension and declination.	6-UDVG: View from Earth, pp. 56-91. Read seriously. BASN: Session 2, Read vocabulary list Session 3. RM: A Sky for all Seasons.
----- Feb. 3, Feb. 4, 2014	7 M Tu	Monday class, Boyertown Planetarium. Tuesday class Archaeoastronomy in CHOS: 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.
----- Feb. 5, Feb. 6, 2014	8 W Th	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.	8-BASN: Sessions 3 and 4 RM: Aspects and Motions of the Moon, Eclipses.
----- Feb. 10, Feb. 11, 2014	9 M Tu	At the Boyertown Area Sch. Dist. Planetarium: Students carpool in teams. Seasonal constellations. Stonehenge decoded, Coordinate Systems: Altitude and azimuth, latitude and longitude, equatorial coordinate system, precession, time, celestial navigation lab introduced, eclipses of the sun and moon demonstrated..	9-BASN: Session 5, get familiar with eclipse vocabulary. There will be a vocabulary quiz.
----- Feb. 12, Feb. 13, 2014	10 W Th	At the Area Boyertown Sch. Dist. Planetarium: Lunar and Solar Eclipses Students carpool in teams. Basic eclipse terminology, repetition of eclipses, the saros, parameters which influence eclipses, chasing eclipses, planetary motions, and configurations, constellations. Video: The Great Eclipse, 25 minute segment leading up to and through totality if time permits.	10-BASN: Session 5 RM: Aspects and Motions of the Moon; Eclipses.
----- Feb. 17, Feb. 18, 2014	11 M 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.	11-BASN: Session 4 UDVG: pp. 120-123. pp, 230-261. RM: Telescopes in General

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Feb. 19, Feb. 20, 2014	12 W Th	Telescopes: Eclipse Vocabulary Quiz. Make a drawing through a telescope and analyze your experiences. The physics/nature of light, as it applies to telescopes. The telescopes of Galileo and Newton.	12-BASN: Session 6 RM: Telescopes in Particular
----- Feb. 24, Feb. 25, 2014	13 M Tu	Telescopes and the Universe: Different types of telescopes , economizing the size of telescopes, Identifying different types of telescopes lab. “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
----- Feb. 26, Feb. 27, 2014	14 W 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.
Mar. 2- Mar. 9, 2014		SPRING BREAK! No classes during the week of March 2	SPRING BREAK
----- Mar. 10, Mar. 11, 2014	15 M Tu	At the LVAAS Planetarium: Meeting time 6:45 p.m. 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. 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.	15-UDVG: Constellations, pp. 328-480 (N. Hem. Only), Skim through some of the major constellations and enjoy. Give yourself an hour for this assignment.
----- Mar. 12, Mar. 13, 2014	16 W Th	Catch up Class: THERE WILL BE CLASS. If the weather looks bad for Monday and Tuesday, we will hold the Lehigh Valley Amateur Astronomical Society field experience at this time and switch lessons. This free date will help your instructor stay more instep with the syllabus.	16-TBA:
----- Mar. 17, Mar. 18, 2014	17 M Tu	Characteristic of Stars/Determining the Distances to the Stars: Basic characteristic of main sequence stars, apparent and absolute magnitudes, the skinny triangle and parallax, the parsec, Calculating Distances from Parallax Angles lab , distance modulus introduced. This lesson helps to clarify the “Y” axis of the Hertzsprung-Russell diagram Possible quiz on Session 14 vocabulary.	17-BASN: Session 14

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Mar. 19, Mar. 20, 2014	18 W Th	<u>Distance Modulus and The Nature of Light:</u> Parallax continued— Great Summer Triangle lab. 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. This lesson clarifies the Y-axis of the Hertzsprung Russell diagram.	18-BASN: Session 14 UDVG: Milky Way, Stars 224-231
----- Mar. 24, Mar. 25, 2014	19 M Tu	<u>Dark Sky Observing at Shooting Star Farm, Ghost Mountain: Dress Warmly!</u> Constellations, view deep sky objects with telescopes, calculate the number of stars visible from the farm, Finger Angle Lab. Go date on the first clear night. Arrive at the farm no later than 7:20 p.m., EDT. Bring binoculars/Finger Angles lab Primary: Mon., March 24— Tues., March 25 Secondary: Wed., March 26— Thur., March 27 Mon., March 31— Tues., April 1 Wed., April 2----- Thurs., April 3 -----Pupils arrive, 7:20 pm, EDT-----	19-BASN: Session 16 Review Finger Angle lab UDVG: Constellations, pp. 328-431 (N. Hem.), skim, enjoy—repeated from Jan. 28 readings Class starts at 6:15 pm
----- Mar. 26, Mar. 27, 2014	20 W Th	<u>Spectral Classification:</u> (two labs) Fluorescence Spectroscopy Lab. and element identification quiz. Absorption spectroscopy lab, This lesson clarifies the X-axis of the Hertzsprung Russell diagram.	20-BASN: Session 14 UDVG: MW, pp. 232-269.
----- Mar. 31, Apr. 1, 2014	21 M Tu	<u>Construction of a Hertzsprung-Russell Diagram:</u> (lab) Students will construct an accurate color-coded representation of an H-R Diagram from some of the 30 brightest stars and the 30 nearest stars as seen from the Earth and make some basic conclusions about stars. Work on questions associated with lab.	21-BASN: Session 14 UDVG: MW, pp. 232-269.
----- Apr. 2, Apr. 3, 2014	22 M Th	<u>Stellar Evolution and the H-R Diagram:</u> Question discussion. 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 from us to measure their parallax angles or the age of star clusters? H-R diagram and why are stars is variable.	22-BASN: Session 14 UDVG: MW, pp. 270-291
----- Apr. 7, Apr. 8, 2014	23 M Tu	<u>Solar System Characteristics:</u> Definition of selective vocabulary words, Graphical Understanding of SS Characteristics lab, SS characteristics discussed, Kepler’s three laws of planetary motion, Ellipse lab—sketch an orbit, angular momentum, universal gravitation.	23-BASN: Session 7, review insert section. UDVG: SS, pp. 114-119. RM: Nine Planets
----- Apr. 9 Apr. 10, 2014	24 W Th	<u>Introduction to the Solar System:</u> Invasion of the Sarbra People lab. 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.	24-BASN: Session 7, review insert section. UDVG: SS, pp. 114-119. RM: Nine Planets

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Apr. 14, Apr. 15, 2014	25 M Tu	Comparative Planetology—The Earth: Atmosphere and its circulation; earthquakes, interior structure, and differentiation; plate tectonics, magnetic field, amount of volatiles contained within the Earth. Plate Tectonics Lab.	25-BASN: Session 8, review insert section. UDVG: SS, pp. 138-147.
----- Apr. 16, Apr. 17, 2014	26 W 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. NO CLASSES ON THURSDAY, APRIL 17 AND MONDAY, APRIL 21: IF TIME IS MADE UP.	26-BASN: Session 9, review questions. UDVG: SS, pp. 148-159. EASTER BREAK
----- Apr. 21, Apr. 22, 2014	27 M Tu	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 on Mars. UDVG: SS, pp.160-175.
----- Apr. 23, Apr. 24, 2014	28 W Th	Comets and Other Small Solar System Bodies: We will talk about comets and their relationship to other small solar system bodies. Lab Demonstration: Make a Comet from scratch. Students receive "cheat sheet" for second exam.	28-BASN: Session 12 UDVG: pp. 206-223
----- Apr. 29, Apr. 30, 2014	29 Tu W	SECOND EXAM on lessons 15 through 28: Same weight as the first exam (65 points). Student driven review for the first hour of class, two-hour exam. Students may stay longer. Class period starts at 6:30 p.m. WE WILL TRY TO COMBINE CLASSES FOR THIS EXAM!	Happy Summer! WE MADE IT! Happy Summer Vacation

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 free 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—

Unexcused absences, in addition to receiving an attendance deduct, your grade may result in a zero for all class activities missed or assigned during the time when you were AWOL.

If you are going to be absent or late, please contact your instructor so that he knows where you are. It makes for a smoother running class and a better relationship between student and teacher.

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 quiz or maybe even the entire course. You may be forced by Moravian College to change your major, particularly if you are an education 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. Consider talking to your instructor about your disability, because if he/she does not understand its nature, it will be impossible for him or her to accommodate that problem. Because of Federal Legislation, instructors are not informed of the specifics regarding a student's learning or physical disabilities.

Laptops/Notebooks 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, cell/smart phones should be kept from view. 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 please feel free to leave the classroom to make your call. **I consider text messaging during class time to be rude behavior.** 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. Distractions hurt that process.**

Electronic Recording of Class Presentations Unless Specifically Approved by Administration is 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 viewing the heavens from a dark site, and another from a more urban location. 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)