

Moravian College Astronomy—Spring Term 2016

Mon./Wed. (EASC-130 PM) and Tues./Thurs. (EASC-130 PN), 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

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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 \$30 and is your main textbook. Cash will be accepted. Checks should be made payable to Moravian College Astronomy. *Universe: A Definitive Visual Guide* and the reading manual are for supplemental assignments. The *Universe* book may not be marked up in any way.

Students will always bring to class their *Astronomy Survival Notebook*, 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 class order (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 there is a planned field trip or Mon.-Wed./Tues.-Thurs. classes will be combined.

Date	CI	Topics of Discussion	Texts: BASN/UDVG/RM
----- Jan. 18, Jan. 19, 2016	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 can or do not already own a pair. Do not buy binoculars.
----- Jan. 20, Jan. 21, 2016	2 W Th	Areas of Interest/Popular Misconceptions: Five areas of focus in astronomy, Vocabulary quiz... Harvard University's Misconceptions Test (for fun), Astrology vs. Astronomy; Inverse Square Law, Test Your Visual Knowledge of Astronomy exercise if time permits	2-BASN: Session 2: Popular Misconceptions in Astronomy UDVG: pp 6-7.
----- Jan. 25, Jan. 26, 2016	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.
----- Jan. 27, Jan. 28, 2016	4 W Th	Popular Misconceptions: EARTH, SUN, MOON RELATIONSHIPS. Phases of Moon: put phases in correct order, students demonstrate phases, phase worksheet, identify the phase at your birth, sample phases of the moon quiz, moon illusion, the blue moon. Quiz: Sky for all Seasons. Are you reading <i>StarWatch</i> ? Seasons Lab: Students show graphically seasonal effects from different latitudes and answer questions pertinent to lab if time permits.	4-UDVG: View from Earth, pp. 56-91. Read seriously. BASN: Session 2, Review misconceptions pertaining to the moon. RM: A Sky for all Seasons.

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Feb. 1, Feb. 2, 2016	5 M Tu	At the Boyertown Area SD Planetarium: CLASS FROM 7-9 P.M. Maps in Student Section of <i>BASN</i> . Know your teams' pickup location. Give yourself a minimum of one hour to get there. EARTH, SUN, MOON RELATIONSHIPS. Introduction to the planetarium environment, seasonal effects from home and around the world, lunar phases, Lunar Phase Rise and Set Time Lab if time permits. A few basic constellations will be identified.	5-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.
----- Feb. 3, Feb. 4, 2016	6 W Th	Popular Misconceptions: EARTH, SUN, MOON RELATIONSHIPS. Traditions of the Sun web assignment handed in. PowerPoint: Introduction to the Ancestral Puebloans. The Mystery of Chaco Canyon video. Seasons Lab questions discussed if the lab was assigned.	6-UDVG: View from Earth, pp. 56-91. Read seriously. BASN: Session 2, Familiarize yourself with vocab., Session 3.
----- Feb. 8, Feb. 9, 2016	7 M Tu	At the Boyertown Area Sch. Dist. Planetarium: CLASS FROM 7-9 P.M.: Eclipses of the sun and the moon, Stonehenge decoded, Stonehenge Lab, altitude and azimuth, equatorial coordinate system, precession, if time permits. Clipboards, pencils, rulers provided by the Boyertown ASD Planetarium.	7-BASN: Session 3: RM: A Sky for all Seasons.
----- Feb. 10, Feb. 11, 2016	8 W Th	Archaeoastronomy: Save Your People, Win That Girl completed in class. Teams construct working calendars derived from astronomical observations. Pupils present examples of calendar construction. PowerPoint: Focusing on Chaco Culture —Pueblo Bonito and A Picture is Worth 1000 Words exercises.	8-BASN: Sessions 3 and 4 RM: Aspects and Motions of the Moon, Eclipses.
----- Feb. 15, Feb. 16, 2016	9 M Tu	Equatorial Coordinate System Lab: Pupils locate and plot a month's worth of lunar positions to become familiar with the equatorial coordinate system of right ascension and declination and the motions of the moon. Eclipses of the Sun and Moon: Introduction of concepts, Distill the Word to it Basic Meaning.	9-BASN: Session 5, emphasizing vocabulary RM: Aspects and Motions of the Moon; Eclipses.
----- Feb. 17, Feb. 18, 2016	10 W Th	Eclipses of the Sun and Moon: Eclipse Vocabulary Quiz. PP presentation on eclipses focusing on the repetition of eclipses, the saros, and visual aspects of viewing eclipses. Video: <i>The Great Eclipse Chase</i>	10-BASN: Session 5, Eclipses of the Sun and Moon UDVG: pp. 120-123. pp. 230-261.
----- Feb. 22, Feb. 23, 2016	11 M Tu	Telescopes: 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.	11-BASN: Session 6 RM: Telescopes in General and in Particular.

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Feb. 24, Feb. 25, 2016	12 W Th	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 which details the history of astronomy and the contributions that the telescope has made to the field. The video will be used as a moving PowerPoint presentation. Simpson's: Bart's comet quiz.	12-BASN: Session 5 RM: Telescopes in Particular.
----- Feb. 29, Mar. 1, 2016	13 M Tu	At the Boyertown Area Sch. Dist. Planet.: Eclipses and Constellations: All about the constellations in an interactive students discover them by themselves mode... Red flashlights needed. Identify star patterns outside with green laser (after the program) if weather conditions permit. Exam review questions distributed. Mid-term grades	13-BASN: Session 6 RM: Telescopes in General and Telescopes in Particular.
----- Mar. 2, Mar. 3, 2016	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 30 minutes of class, prior to exam. Students will receive a study guide at the end of the previous class.	14- Review necessary material in texts. Write out questions for discussion.
Spring Break Week		S P R I N G B R E A K ! No classes Monday-Thursday, March 7-10	SPRING BREAK
----- Mar. 14, Mar. 15, 2016	15 M Tu	Getting to know Moravian's telescopes: Teams will be formed and students will learn how to disassemble and reassemble the telescopes in Room 106. If the weather looks favorable we might even take the scopes upstairs on the Sky Deck to view the moon. If the scopes are taken upstairs, this class will be longer than usual. Lesson 15 and 16 could be interchanged.	15-BASN: Appendix 2, Assembly and Disassembly of telescopes, Session 14, vocabulary.
----- Mar. 16, Mar. 17, 2016	16 W Th	Characteristic of Stars/Determining the Distances to the Stars: Goals for studying stellar evolution. Basic characteristics of Main Sequence stars, the skinny triangle parallax, and the parsec, Calculating Distances from Parallax Angles Lab , This lesson helps to begin to clarify the "Y" axis of the Hertzsprung-Russell diagram Quiz on Session 14 vocabulary.	16-BASN: Session 14, Emphasize vocabulary words, main sequence star characteristics, and the section on parallax.
----- Mar. 21, Mar. 22, 2016	17 M Tu	Distance Modulus and the Great Summer Triangle Lab: Students will calculate the absolute magnitudes of the stars of the Great Summer Triangle to prove that what you see is not what you necessarily expect. This will conclude the formulation of the "Y-axis" of the Hertzsprung Russell diagram. Evolution of Stars video...	17-BASN: Session 14, Emphasis on the distance modulus and questions through the nature of light.
----- Mar. 23, Mar. 24, 2016	18 W Th	The Nature of Light: Doppler shift, black body radiation curves, colors of stars, Wien's law, 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, nature of light, black body radiation curves, Wien's law. UDVG: Milky Way, Stars pp. 224-231.

Date	CI	Topics of Discussion	Texts: BASN/UDVG/RM
2016		E A S T E R R E C E S S No astronomy classes are missed, but if you work ahead a full period, a class could be dropped.	EASTER RECESS
----- Mar. 28, Mar. 29, 2016	19 M Tu	Dark Sky Observing at Shooting Star Farm, Ghost Mountain: Dress Warmly! 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 6:30 p.m., EDT. Bring binoculars/Finger Angles lab Primary: Tues., Mar. 29 Secondary: Wed., Mar. 30—Thurs., Mar. 31 Mon., April 4— Tues., April 5 Wed., April 6— Thurs., April 7 Mon., April 11—Tues., April 12 ---Pupils arrive, 7:30 pm, EDT---- After we return from the Easter Break, emphasis will also be placed upon using Moravian's telescopes and making observations from the Sky Deck of the Collier Hall of Science. I would anticipate having 2-3 evenings of viewing from Moravian's campus. The last night would be reserved for a quiz. Because the weather is changeable, it is difficult to predict an accurate syllabus beyond this point.	19-UDVG: Constellations, pp. 328-480 (N. Hem. Only), Skim through some of the major constellations and enjoy. Give yourself an hour for this assignment. From this point onward, observing takes precedence over the other lessons which are listed below. If weather conditions are favorable, we probably will not make it to the solar system material.
----- Mar. 30, Mar. 31, 2016	20 W Th	Spectral Classification: (two labs) Fluorescence Spectroscopy Lab. and element identification. The Bohr atom. Identification lab and quiz on emission spectroscopy. Absorption spectroscopy lab, This lesson clarifies the "X-axis" of the Hertzsprung Russell diagram.	20-BASN: Session 14 Read several times The Principles of Spectroscopy, Plasma ID Lab, Doppler shift.
----- Apr. 4, Apr. 5, 2016	21 M Tu	Absorption Spectroscopy Lab; Construction of a Hertzsprung-Russell Diagram: Students will classify stars via their absorption spectra. After this lab is successfully completed, an accurate color-coded representation of an H-R Diagram from the 30 brightest stars and the 30 nearest stars will be constructed. Work on questions associated with this lab for homework.	21-BASN: Session 14: Classifying Absorption Spectra Lab. UDVG: Milky Way, pp. 232-269.
----- Apr. 6, Apr. 7, 2016	22 W Th	Stellar Evolution and the H-R Diagram: Questions 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, Age of Star Clusters Lab. H-R diagram and why stars become variable.	22-BASN: Session 14: Construction of an HR-Diagram lab. UDVG: Milky Way, pp. 270-291.
----- Apr. 11, Apr. 12, 2016	23 M Tu	Solar System Characteristics: 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.

Date	CI	Topics of Discussion	Texts: BASN/UDVG/RM
----- Apr. 13, Apr. 14, 2016	24 W Th	Introduction to the Solar System: Invasion of the Sarbra People Lab. Universal gravitation, magnetic fields, volatile versus refractory materials, a possible sequence of events for the origin of the solar system, meteorites and their relationship to the origin of the solar system, calculating the mass of Jupiter.	24-BASN: Session 7, review insert section. UDVG: SS, pp. 114-119. RM: Nine Planets
----- Apr. 18, Apr. 19, 2016	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 notes/questions and Plate Tectonics lab. UDVG: SS, pp. 138-147.
		THANKSGIVING BREAK No classes Wednesday/Thursday, November 18-20 We are almost there!	THANKSGIVING BREAK
----- Apr. 20, Apr. 21, 2016	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	26-BASN: Session 9, Review notes/questions. UDVG: SS, pp. 148-159.
----- Apr. 25, Apr. 26, 2016	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; <i>Spirit</i> , <i>Opportunity</i> , <i>Phoenix</i> , and the Mars Science Laboratory, <i>Curiosity</i> , make their marks.	27-BASN: Session 10, review questions on Mars. UDVG: SS, pp.160-175.
----- Apr. 27, Apr. 28, 2016	28 W Th	Catch up Class: THERE WILL BE CLASS.	28-TBA
----- May 2, May 3, 2016	29 M Tu	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.	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 heavens.
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.

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 ALSO HAVE A RESPONSIBILITY TO ASSIST IN KEEPING CLASSES INTERESTING AND DYNAMIC. This will also help me to achieve my greatest potential as an educator. What are some the criteria for appropriate participation?

1. In non-testing situations, helping others who may be having difficulty in understanding conceptual ideas, performing demonstrations, or working mathematical exercises. Those who have more to give need to give more.
2. Asking and answering questions during class presentations and laboratory exercises.
3. Being a team player or a team leader.
4. Assisting your instructor with improving his astronomy lessons, his *Astronomy Survival Notebook*, and his website through constructive criticism or in noting errors.
5. Volunteering as a driver for field experiences to help class members get to their destinations safely.

Attendance Policy: **Students will sign in when they arrive to class.** Students are expected to attend all classes, to be on time (6:30 p.m.), and to be in a state of preparedness regarding the instructional material. 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 a zero is attained. **Students with additional excused absences will see no further reduction in points.** To avoid penalty, pupils who receive an excused absence will be expected to provide legitimate, documented proof about why they were absent. The excuse must be valid for the day(s) of absence. To assist in expediting this process, students may use the *Medical Excuse Note Policy* form found in the Student Information section of their

Astronomy Survival Notebook. Please note that if you skip class after the break, or before an observing session, your instructor will consider your absence unexcused for the entire class period. The 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 unexcused absence 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 for a better relationship between student and teacher when students are proactive.

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 the quiz or maybe even the entire course. You may be forced by Moravian College to change your major, particularly if you are planning a career in education.

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. Examples of permissible uses of a smart phone in class are to look up information pertinent to the ongoing discussion, the use of an astronomy application, as a calculator in a non-testing situation, or as a flashlight when going outside to observe. Emergencies do happen, so if you 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 impolite 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 understand the plot fully. Smart/Cell phone distractions impede that process.**

Laptops/Notebooks/iPads will be permitted in class as long as they are being used in an academically honest manner.

Learning Disabilities: Students who wish to request accommodations in this class for a disability should contact the Academic Support Center, located in the lower level of Monocacy Hall, or by calling 610-861-1401. Accommodations cannot be provided until authorization is received from the Academic Support Center.

Greyhound Tutoring provides course-specific tutors to Moravian students, free of charge. If you would like to work with a Greyhound Tutor to boost your academic success, please request a tutor through <http://bit.ly/NeedTutorMC> (case-sensitive). Plan ahead! It takes 2-3 business days to connect you with a tutor. Please email Dana Wilson (wilsond@moravian.edu), Tutor Coordinator, for more information about this service.

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

Snacks and Beverages: Class time is not snack time. 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!

No Time to Eat Between Classes: I expect students to have had something to eat prior to class, but I am also aware of the fact that some classes and particularly practice sessions give students very little time to have dinner before class. If you fall into this category, grab something to eat at the HUB, come to class a little early so you can eat your meal, and also be on time when astronomy class begins.

Astronomical Observation Sessions and Field Experiences: Quite frequently when the weather permits, short period class observations will be made from the Collier Sky Deck to view the International Space Station or Iridium Flares. Several field experiences will take place at the Boyertown Area School District Planetarium. At least one field experience will be devoted to viewing the heavens from a dark site, and there will be a minimum of two classes devoted to learning the operations of astronomical telescopes on the Collier Sky Deck. Conditions can be windy and cold, especially during late fall, winter, and early spring. On clear nights when observing sessions will be held, students should bring to class the extra clothing protection needed for the head and hands in addition to normal winter clothing worn during the cold season.

Class Length is from 6:30 p.m. to 9:30 p.m. During times when it is impossible to allow for a break (i.e., observing sessions on the Collier Sky Deck), or pupils choose not to have a break, students will be compensated for their extra time spent in class by being able to choose a free night where no class will be held. A minimum of 160 extra minutes of class time must be accumulated for this to happen.

Style of Classroom Presentations: I like to keep class lively and fresh with a free and open exchange of information between students and teacher. If at anytime you feel uncomfortable with this type of teaching style, please let me know privately so that I can adjust my presentation style.

Faculty Withdrawal of Non-attending Students: Prior to the announced last day for students to withdraw with a "W," instructors may request an administrative withdrawal for a student who has been absent from class without notification for a period of three weeks or more. The request will be submitted to the registrar in writing. [NOTE: Emails count as writing.] The registrar will then consult with one of the academic deans on the appropriateness of the request. If a student's status changes from full-time to part-time as a result of the administrative "W," the bursar and financial aid offices will make appropriate adjustments to the student's account for said term. Students who are absent with notification [for example, they are in the hospital and the instructor has been notified] may not be withdrawn by the instructor.

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

2016 CALENDAR

JANUARY						
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FEBRUARY						
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MARCH						
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APRIL						
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MAY						
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JUNE						
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AUGUST						
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SEPTEMBER						
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OCTOBER						
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NOVEMBER						
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DECEMBER						
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NOTES

*** BECKER'S ***

ASTRONOMY SURVIVAL NOTEBOOK

MORAVIAN COLLEGE STUDENT FOREWORD

ASTRONOMY, as the author of this book teaches it, is an elective course designed for nonscience majors at the undergraduate college level who have always wanted to know more about the universe that surrounds them. The major areas of focus will include a thorough understanding of the sky and its motions, the use of telescopes and making astronomical observations, and the life history of stars. Solar system topics will be considered if time permits. A myriad of topics come into play when those three focus areas are considered. Specific lessons can be seen by viewing the syllabus which outlines the order in which course materials will be presented during the semester.

I am not in agreement with how astronomy is currently being taught at the university level. Most professors attempt to teach the subject in its entirety, glossing over discussions, such as the night sky, eclipses, lunar phases, and the seasons—practical topics that should be known and understood if a person is to be considered well educated. As a result of simply completing the text by the end of the course, no topic, concept, or idea is covered in sufficient depth or with enough repetition for it to become permanently digested by the average student. In addition, many topics become purely exercises in mathematical analysis with the instructor completing the lesson to an audience tuned out and turned off. My goal will be to concentrate on fewer topics, cover them to a greater depth, and supplement and reinforce information with appropriate activities and visuals. This approach will hopefully lead students to a better understanding of the underlying principles and methodologies which guide all scientific thought.

I like to think of astronomy as “the beautiful science.” Aesthetics has always been the chief motivator for my lifelong fascination about the heavens. Because of astronomy’s inherent visual appeal and the mysteries surrounding distant places, I became interested in understanding the science behind the pictures that I was viewing as a kid and as a young adult. It’s been a journey that started back in the late 1950’s when I witnessed a bright shooting star flash across the sky on a windy autumn night as I was making my way to a neighborhood Cub Scout meeting.

This text and the astronomy course in which you are enrolled continue to evolve. Students are encouraged to consider this book as a working copy and to make suggestions for its improvement. If you find an error, please take the time to tell me about it. I am never offended by students who are attempting to improve the academic landscape of this class. Although the lessons are mainly descriptive in nature, they often will have analytical aspects, including some mathematics. Don't panic about this fact. We will get through it together successfully, and you will understand what is happening. Keep a positive attitude, ask lots of questions, follow my suggestions and instructions, complete work on time and in an orderly and neat fashion, and you will be on the fast track for a successful experience in this course.

In order to get the most from this program, I have a website, astronomy.org which should help contribute to the enjoyment and assimilation of the instructional material. The links associated with *Moravian Astronomy* (accessed by clicking your class picture), *Astronomy*, *StarWatch*, *Programming*, *Astrophotography*, and *Resources* should prove to be particularly useful. I also recommend the online astronomy articles found in *Wikipedia* as helpful and generally well written. Although the Internet is an excellent tool for gaining valuable and particularly timely information about astronomical topics, there is a catch. A great deal of the general, online material has no peer evaluation, can be opinionated, and many times is laced with errors. Readers, beware!

Thank you for perusing my intentions for this curriculum by reading the "Student Foreword," and much success as we journey together through the universe and the contents of this course.

Ad Astra!

Gary A. Becker
January 10, 2016

*** BECKER'S ***

ASTRONOMY SURVIVAL NOTEBOOK

DESCRIPTION OF CURRICULUM: ASTRONOMY is a course designed for individuals who have always wanted to explore the universe around them. Topics of discussion will include lessons on astronomical misconceptions, archaeoastronomy (astronomy of the ancients), eclipses, instrumentation, the evolution and characteristics of the solar system, and the life and death of stars. Students will also gain familiarity with the heavens through planetarium visits and observations of the real sky.

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.

GRADING PROCEDURE: Students' semester grades will be determined by the number of points accumulated, divided by the total number of points possible. An attendance grade and a participation grade will then be added to this numerical percentage to produce the final grade. Semester grades will be accrued from the following criteria:

1. **Examinations:** There will be two examinations. They will not be cumulative. The first exam will occur after the traditional Moravian midterm date and is generally longer and of greater weight. The second test will occur on the night of the final exam. The tests will be mainly objective in nature and compiled from classroom discussions, field trips, observing sessions, and reading assignments. The exams will be difficult and will account for about one third of your final grade. Grades in an exam will always be scaled upward, if warranted. Grades will never be scaled lower.
2. **Quizzes:** Numerous announced quizzes will be administered during the semester. Each quiz will be approximately 10-25 minutes in duration and usually consist of questions that will be answered in written form. Grades will never be scaled.
3. **Laboratory Exercises:** Laboratory exercises will be assigned to students as class work and as homework assignments. **Accuracy, clarity of presentation, and neatness** will be used as criteria for grading purposes. When graphs or drawings are submitted for correction, the following weights will be assigned: accuracy (60% of grade), labeling (20% of grade), and neatness (20% of grade).

4. **Work that is late:** Generally work that is submitted late will receive a lower grade than work submitted on time. Failure to complete assignments within a reasonable period of time will result in a reduced grade or a grade of zero being assigned.
5. **Absenteeism:** Students are responsible for making up all missed work within a reasonable time interval when legally absent. Depending upon the circumstances, pupils who have illegal absences may not be granted the same privilege of completing missed work for a grade.
6. **Participation:** Meaningful participation will be acknowledged through additional credit that could significantly alter a student's grade. A student's grade, however, will never be lowered if he or she chooses not to participate in classroom discussions.
7. **Free Points:** Students can accumulate free points from the "What is it" questions and other exercises. These points are added only to the numerator of the final grade fraction.
8. **Notebook Information:**
 - a. Each student is required to keep a notebook containing all information that is given in class and any materials otherwise assigned. Your *Astronomy Survival Notebook* should serve this purpose well. It is your main text for the course.
 - b. Your *Astronomy Survival Notebook* should be brought to every class except on dates when field experiences are scheduled.
 - c. The replacement value of a lost *Astronomy Survival Notebook* will be the same as its initial purchase price as found on page i of this syllabus.
10. **Extra Credit:** No extra credit will be allowed this semester. When it is permitted, it will be sanctioned only if a student's grade is a "C" or better. Permission from your instructor is mandatory. Please see the specific page devoted to this topic found in the introductory material of this section.
11. **Semester Grades:** Scaled examination scores, quizzes, class participation, free points, and laboratory exercises will determine semester grades. Participation could add as many as five percentage points to a semester grade.
12. **Student Access to Grades:** Students will always have access to their current grades while remaining anonymous to their peers taking the course.

About Your Instructor:

Name: Gary A. Becker

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

Home Page: astronomy.org

Education: William Allen High School (1968), BS, Kutztown University (1972)
MA, West Chester University (1984)

Hobbies: Astronomy, photography/astrophotography, writing, traveling

Memberships: American Astronomical Society, Lehigh Valley Amateur Astronomical Society, Inc., Pennsylvania Earth Sciences Association

Personal Philosophy of Education: The educational process should be enjoyable. Ideally, pupils should want to attend classes because of their own innate curiosities. Teachers should try to create a classroom in which the student feels emotionally at ease while at the same time he or she is being academically challenged.

Student Responsibilities: Students should make an honest attempt to grasp the lessons and homework assignments. In class he or she should play an assertive role in trying to gain familiarity with the subject material. Most importantly, a student should be honest with himself, his peers, and his teachers. In other words, no B.S., please!

Bring to each class your *Astronomy Survival Notebook*, a pencil, a pen, a calculator, and a flashlight. Smart phones may qualify for the latter two applications, except during exams.

FORMULA FOR SUCCESS in Astronomy EASC-130, Moravian College Astronomy:

1. **Complete the exercises in your *Astronomy Survival Notebook*.** Skim through the chapters before they are discussed in class, so that you will know what is considered important. Then read them again. Answer the questions in the back of each chapter.
2. **Use your *Astronomy Survival Notebook*, *Universe* text, reading material book, Reeves Library, Internet, and instructor as resource avenues.** I am ready and willing to assist you in any reasonable way to help your achievement in this course. Astronomy has been my life's vocation, as well as my hobby, and I want you to be successful.
3. **Possess some mathematical skills** (at least through algebra).
4. **Study** for exams over a period of several days.
5. **Review the lecture slides** at www.astronomy.org/moravian/index.html. Remember that a picture is worth a thousand words.
6. **Participate** in classroom activities, take notes, and ask questions when in doubt. In other words, be an active learner and a team player.
7. **Complete assignments on time** and laboratory exercises in a neat and orderly fashion.
8. **Attend class** regularly. You miss class; you miss out, and your grade will suffer!
9. **Practice The Golden Rule: *Do unto others as you would have others do unto you.*** Treat me with respect, and I will have no trouble returning the same favor to you.
10. **The Moravian College Official Code of Conduct applies to all students, but especially to those who feel that cooperation, responsibility, respect, and tolerance ARE NOT important to the educational process.** Kindly remember that **EDUCATION IS NOT A DEMOCRACY**, but it does not have to be a dictatorship either.

NEED HELP? Please feel free to stay after class if you need extra help. If you are ill, it would be to your advantage to contact your instructor to see what you have missed. I can be reached at 610-390-1893 or garyabecker@gmail.com or beckerg@moravian.edu.