

Moravian College Astronomy—Spring Term 2015

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

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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 \$25 and is your main textbook. Checks will be made payable to Moravian College Astronomy. Cash will also be accepted. *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. 19, Jan. 20, 2015	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.
----- Jan. 21, Jan. 22, 2015	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.
----- Jan. 26, Jan. 27, 2015	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. 28, Jan. 29, 2015	4 W Th	Popular Misconceptions: EARTH, SUN, MOON RELATIONSHIPS. Phases of Moon: put phases in order, students demonstrate phases, phase worksheet, identify the phase at your birth, sample phases of the moon quiz, moon illusion, the blue moon. Seasons Lab: Students show graphically seasonal effects from different latitudes and attempt to answer questions pertaining to the altitude graphs they have constructed. Other misconceptions discussed.	4-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.

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
<p>----- Feb. 2, Feb. 3, 2015</p> <p>Classes Combined?</p>	<p>5 M Tu</p>	<p><u>At the Kutztown University or Boyertown Planetarium:</u> 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. Constellations ID. Perhaps Monday/Tuesday classes can be combined</p>	<p>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</p>
<p>----- Feb. 4, Feb. 5, 2015</p>	<p>6 W Th</p>	<p><u>Popular Misconceptions:</u> EARTH, SUN, MOON RELATIONSHIPS. Traditions of the Sun web assignment handed in. Seasons lab questions discussed in class. PowerPoint: introduction to the Ancestral Puebloans. The Mystery of Chaco Canyon video.</p>	<p>6-UDVG: View from Earth, pp. 56-91. Read seriously. BASN: Session 2, Read vocab. list Session 3.</p>
<p>----- Feb. 9, Feb. 10, 2015</p>	<p>7 M Tu</p>	<p><u>At the Boyertown Area Sch. Dist. Planetarium:</u> Students carpool in teams. Coordinate Systems: Altitude and azimuth, latitude and longitude, equatorial coordinate systems, precession, time, celestial navigation lab introduced. Stonehenge decoded. Constellations.</p>	<p>7-BASN: Session 3: RM: A Sky for all Seasons.</p>
<p>----- Feb. 11, Feb. 12, 2015</p>	<p>8 W Th</p>	<p><u>Archaeoastronomy:</u> 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.</p>	<p>8-BASN: Sessions 3 and 4 RM: Aspects and Motions of the Moon, Eclipses.</p>
<p>----- Feb. 16, Feb. 17, 2015</p>	<p>9 M Tu</p>	<p><u>Eclipses of the Sun and Moon:</u> Eclipse vocabulary quiz. PP presentation on eclipses focusing on the repetition of eclipses, the saros, and visual aspects of viewing eclipses. <u>Equatorial Coordinate System Lab:</u> Pupils locate plot a month of lunar positions to become familiar with the equatorial coordinate system of right ascension and declination. Students complete as homework assignment.</p>	<p>9-BASN: Session 5, Eclipse vocabulary quiz RM: Aspects and Motions of the Moon; Eclipses.</p>
<p>----- Feb. 18, Feb. 19, 2015</p>	<p>10 W Th</p>	<p><u>Celestial Navigation Lab:</u> 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.</p>	<p>10-BASN: Session 4 UDVG: pp. 120-123. pp. 230-261. RM: Telescopes in General</p>
<p>----- Feb. 23, Feb. 24, 2015</p>	<p>11 M Tu</p>	<p><u>Telescopes:</u> 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.</p>	<p>11-BASN: Session 6 RM: Telescopes in Particular</p>
<p>----- Feb. 25, Feb. 26, 2015</p>	<p>12 W Th</p>	<p><u>Telescopes and the Universe:</u> 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. Bart's comet quiz.</p>	<p>12-BASN: Session 5 RM: Aspects and Motions of the Moon: Eclipses. Get familiar with eclipse vocabulary because there will be a vocabulary quiz.</p>

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Mar. 2, Mar. 3, 2015	13 M Tu	At the Boyertown Area Sch. Dist. Planet.: Eclipses and Constellations: 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. Exam review questions distributed. Mid-term grades	13-BASN: Session 6 RM: Telescopes in General and Telescopes in Particular
----- Mar. 4, Mar. 5, 2015	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.
Spring Break Week		S P R I N G B R E A K ! No classes Monday-Thursday, March 9-12 Not long enough...	SPRING BREAK
----- Mar. 16, Mar. 17, 2015	15 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: Mon., Mar. 16— Tues., Mar. 17 Secondary: Wed., Mar. 18— Thurs., Mar. 19 Mon., Mar. 23— Tues., Mar. 24 Wed., Mar. 25— Thurs., Mar. 26 ---Pupils arrive, 6:30 pm, EDT----	15-BASN: Session 16 Review Finger Angle lab UDVG: Constellations, pp. 328-431 (N. Hem.), skim, enjoy—repeated from Jan. 28 readings Class starts at 6:30 pm
----- Mar. 18, Mar. 19, 2015	16 W Th	Catch up Class: THERE WILL BE CLASS. If the weather looks bad for Monday and Tuesday, we will hold the Shooting Star Dark Sky event at this time. This free date will allow your instructor to bring the syllabus more in line with the lessons.	16-TBA:
----- Mar. 23, Mar. 24, 2015	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 Quiz on Session 14 vocabulary.	17-BASN: Session 14
----- Mar. 25, Mar. 26, 2015	18 W Th	Distance Modulus and The Nature of Light: 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

Date	CI	Topics of Discussion	Texts: BASN/UDVG/RM
----- Mar. 30, Mar. 31, 2015	19 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. Rain Date, Apr. 1/2	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..
----- Apr. 1, Apr. 2, 2015	20 W Th	Spectral Classification: (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
2015		E A S T E R R E C E S S No Astronomy Classes are Missed	EASTER RECESS
----- Apr. 6, Apr. 7, 2015	21 M Tu	Construction of a Hertzsprung-Russell Diagram: (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. 8, Apr. 9, 2015	22 W Th	Stellar Evolution and the H-R Diagram: 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. 13, Apr. 14, 2015	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
----- Apr. 15, Apr. 16, 2015	24 W Th	Introduction to the Solar System: 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
----- Apr. 20, Apr. 21, 2015	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.
		T H A N K S G I V I N G B R E A K No classes Wednesday/Thursday, November 18-20 We are almost there!	THANKSGIVING BREAK

Date	CI	Topics of Discussion	Texts: BASN/UDVG/RM
----- Apr. 22, Apr. 23, 2015	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. 27, Apr. 28, 2015	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. 29, Apr. 30, 2015	28 W Th	Catch up Class: THERE WILL BE CLASS. If the weather looks bad for Monday and Tuesday, we will hold the Shooting Star Dark Sky event at this time. This free date will allow your instructor to bring the syllabus in line with the lessons.	
----- May 4, May 5, 2015	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. *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 ALSO HAVE A RESPONSIBILITY TO ASSIST IN KEEPING 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 for 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 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 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.

Learning Disabilities: Students who wish to request accommodations in this class for a disability must contact Ms. Elaine Mara, assistant director of academic support services 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.

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

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 your smart phone in class to look up information pertinent to the ongoing discussion, as a calculator in a non-testing situation, or as a flashlight when going outside to observe is certainly 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 understand the plot fully. Smart/Cell phone distractions hurt that process.**

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 kind of a situation, 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: 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 clothing 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)

2015

January						
Su	Mo	Tu	We	Th	Fr	Sa
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February						
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March						
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29	30	31				

April						
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May						
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31						

June						
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28	29	30				

July						
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August						
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30	31					

September						
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27	28	29	30			

October						
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November						
Su	Mo	Tu	We	Th	Fr	Sa
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29	30					

December						
Su	Mo	Tu	We	Th	Fr	Sa
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27	28	29	30	31		

*** 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 life history of stars, and the characteristics of the solar system and its formation. 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 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 young adult. It’s been a journey that started back in the late 1950’s when I witnessed a shooting star sparkle across a windy autumn sky on my way to a neighborhood Cub Scout meeting.

This text and the astronomy course in which you are enrolled continue to evolve. Students are always 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 and ask lots of questions, follow my suggestions and instructions, complete work on time 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, www.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 1, 2015

*** 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. 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 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. Questions may include material that students must acquire from the Internet. Grades will never be scaled.
3. **Laboratory Exercises:** Laboratory exercises will be assigned to students as class work and 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.
5. **Absenteeism:** Students are responsible for making up all missed work when legally absent. Illegal absences may not be granted that same privilege depending upon the circumstances.
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. Your notebook must be:
 - 1) **Complete:** It should include class lecture notes and PowerPoint/blackboard illustrations, handout sheets, work sheets, etc.
 - 2) **Organized:** Keep information from one topic separate from other topics.
 - 3) **Neat:** Information must be neat and legible.
 - 4) **Up-to-date:** Your notebook may be checked at any time.
 - c. The replacement value of a lost *Astronomy Survival Notebook* will be the same as its initial purchase price.
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, notebook accuracy, 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 peer taking the course.

About Your Instructor:

Name: Gary A. Becker

Office phone: Mobil: 610-390-1893 / Moravian Office: 610-891-1476

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

Home Page: www.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 aggressive 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.
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.

EXTRA CREDIT ASSIGNMENTS
MORAVIAN COLLEGE ASTRONOMY—ESAC 130
NO EXTRA CREDIT WILL BE ALLOWED THIS SEMESTER

Rational: Extra credit assignments are voluntary in nature, student driven and designed for individuals who are achieving at levels which are considered average or above average. In EASC-130 that rank is 70.0 percent or higher. Students who are achieving below this grade need to concentrate on the core learning objectives and lab assignments to improve before they may attempt extra credit. Do not consider extra credit until after the first exam.

Extra Credit dividends will be in the form of Free Points, not to exceed more than 5 percent of a student's final grade. Fifteen free points will be considered the base number. This will assume that there are 300 points accumulated during the semester. If there are less than 300 points accrued during the grading period, the extra credit points will not be lessened.

- A maximum of 10 points for the successful completion of the project.
- A maximum of 5 points for turning the completed project into a *StarWatch* article which will be considered for publication.

Suggestions for an Extra Credit Project:

- Term paper: including bibliography, footnotes, library (book/magazine) research, as well as the Internet. The length of the body of the presentation will be 750-1000 words.
- An art project: Creative art projects should be sophisticated and astronomically accurate. The project must be accompanied by a written explanation, including citations, and the final piece of art must be shown and explained to the class. (Art-Photography Majors/no StarWatch article)
- An original musical composition or arrangement: The theme of the composition will have to have an astronomical content including written objectives, the musical score, a recording of the musical score, and a performance given to the class (Music Majors/no StarWatch article).
- An oral presentation about an astronomical topic (15 minutes minimum) including outline, diagrams, illustrations, etc., which could be in the form of a PowerPoint presentation.
- A lesson plan with demonstrable objectives and outcomes given to the class (Education Majors only).
- Construction of an astronomical device or model (10 points/15 with StarWatch article).
- A systematic series of observations of the day or nighttime sky over the period of several weeks (10 points/15 with StarWatch article).
- An original short story with an astronomical theme including bibliography, footnotes, library (book/magazine) research, as well as the Internet (10 points/no StarWatch article)
- Your own suggestions, as long as they follow the guidelines, relate to astronomy, or to your planned vocation and astronomy.

Seriousness of Purpose: Since this is a voluntary exercise, students are expected to be purposefully engaged toward achieving a successful end-result for their project. Students who do not apply themselves in a serious fashion to this purpose risk receiving no credit for their efforts. Consider the following as mandatory points:

- Formulating a written thesis statement regarding the chosen topic, presenting this to the instructor, and remaining on task with respect to its fulfillment.
- Keeping the instructor informed of progress during the assignment and implementing suggestions to improve the mission.
- On time completion of the assignment.

MINI-TERM PAPER
(Extra credit or as assigned)

1. Subject: Any topic that has a direct application to astronomy.
2. Length: Two to three pages (750-1000 words).
3. Format: Microsoft Word, New Times Roman font, 14 point, double spaced, one-inch margins, bibliography and footnotes where applicable (not included in page count).
4. Weight: 15 points which includes a *StarWatch* article.
5. Grading: See below.
6. *StarWatch* articles: Must fit template, New Times Roman font, 10 point, no exceptions.

Name _____ Date _____

Title of Paper _____

Grade: 15 pts. - _____ +/- _____ = _____
Checklist
Special Considerations
Final Grade

DETERMINATION OF GRADE

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CLARITY AND ACCURACY:

1. Material organized improperly ----- _____
 2. Information does not make sense ---- _____
 3. Out of date information ----- _____
 4. Incorrect facts, repetitive ----- _____
 5. Incomplete explanations----- _____
 6. No introduction —No conclusion----- _____
 7. Proofreading needs improvement----- _____
- Total point value equals 7----- _____

ENGLISH:

8. Spelling errors—Capitalization ----- _____
 9. Grammar-Punctuation----- _____
 10. Awkward sentences ----- _____
 11. Bibliography style incorrect ----- _____
 12. Footnote needed or style incorrect -- _____
- Total point value equals 5----- _____

NEATNESS:

13. Title page missing. ----- _____
 14. Paper appears sloppy ----- _____
 15. Paper not double-spaced ----- _____
 16. Paper not typed ----- _____
- Total point value equals 3----- _____

Special Considerations:

STARWATCH**StarWatch 834 for the week of August 12, 2012****Mars on Earth**

It rained “on Mars” today, a virtual downpour, complete with lightning, thunder, and huge, cold drops that turned the red Utah desert into a myriad of dendritic rivulets which fused into ruddy brown streams that had to be traversed by my Saturn “rover.” By the time that Boyertown School Dist. Planetarium Director, Peter Detterline, and I had reached the Mars Desert Research Station (MDRS) near Hanksville, Utah, my Bridgestone tires were rimmed by an inch or more of smooth, pebbly sludge. Mars had abundant water 3-1/2 billion years ago, and the five miles of mire that we plodded through to get to the Mars Habitat may have been a common occurrence to those simple microbes which exobiologists believe populated the watery basins of Mars so long ago. Now the real Martian landscape looks desert dry, its water either frozen on the polar caps, hidden near its surface, or liquid at depth. Unlike NASA’s *Curiosity* minivan, just beginning its multiyear journey of discovery on the Martian surface, the MDRS, is a two-story tuna can-shaped habitat which was constructed by the non-profit Mars Society in late 2001. It has been a cost effective alternative for exploring Mars-like terrain on the Earth in a similar fashion as to how astronauts might survey Mars sometime in the future. Another scientific facility, the Flashline Mars Arctic Research Station (FMARS), was constructed in 2000 and is located on Devon Island in Canada’s Baffin Bay. It has been in operation since 2001. Staring at my vision of Mars, the Utah badlands, from the second floor crew quarters of the MDRS, I can see an undulating landscape of red, white, and brown striated hills. There is no vegetation in sight. Albeit the blue, cloud-specked sky, I am witness to a similar terrain that will be greeting the first human explorers of the Red Planet. Yes, I am finally on Mars.

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Moravian College Astronomy

ASTRONOMY CLASS ASSIGNMENT AND ACTIVITY SHEET

Due Date	Activity

MORAVIAN STUDENTS: PLANETARIUM/OBSERVING FIELD TRIP DATES

- 1. Date _____ Depart _____ Return _____
- 2. Date _____ Depart _____ Return _____
- 3. Date _____ Depart _____ Return _____
- 4. Date _____ Depart _____ Return _____
- 5. Date _____ Depart _____ Return _____

MORAVIAN COLLEGE ASTRONOMY
STUDENT INFORMATION SHEET

Today's Date _____

Name _____ Phone _____

E-mail address _____ Student ID Number _____

Major _____ Fresh/Sophomore/Junior/Senior Age _____ Access to a car? Y / N

Did you take Astronomy EASC-130 based upon the recommendation of someone else? Y / N

Hobbies or special interests: _____

Present or proposed career: _____

Reasons for taking this course: _____

Is there anything special in astronomy that you would like to learn while taking this course?

What qualities do you like to see in a teacher? _____

Check the following math courses that you have successfully completed, including those in which you are currently enrolled:

_____ Algebra I _____ Algebra II _____ Algebra III _____ Geometry
_____ Trigonometry _____ Analytical Geometry _____ Calculus _____ Computer Science

Specify other math courses not included above: _____

Specify your attitude towards math: _____



MORAVIAN COLLEGE
A SMALL NATIONAL TREASURE

1200 Main Street
Bethlehem, Pennsylvania 18018-6650

TEL 610 861-1300
WEB www.moravian.edu

**All EASC-130 Astronomy Students
MORAVIAN COLLEGE WAIVER**

Name of Individual *(print)* _____

Description of Activity

Field experiences related to coursework in EASC-130 Astronomy

Date of Activity

See EASC-130 Astronomy Syllabus, where dates, times, and rain dates are given for specific events. Additional dates may be necessary depending upon weather conditions.

Issuing Department

Physics

In consideration of my participation in the activity, listed above, on behalf of myself, my heirs, executors, administrators, successors, or assigns, I hereby release and forever discharge Moravian College, its agents, servants and employees of and from any and all manner of actions, causes of action, suits, damages, claims, and demands, on account of personal injury, including death, or any other cause whatsoever, which I may have against them by reason of or arising out of my participation in the above listed activity.

I further release the college from any and all liability relating to expenses arising from my injury that may occur while I am participating in this activity.

Signature of Authorized Representative of College
Moravian College Astronomy

Date

Signature of Participant

Date

MORAVIAN COLLEGE
 1200 MAIN STREET
 BETHLEHEM PA 18018

All Student Drivers Complete this Form
Acknowledgement of Risk

Student Name _____ Age _____
 (please print name)

A student of Moravian College participating in the following activity:

See EASC-130 Astronomy Syllabus, where dates, times, and rain dates are given for specific events. Additional dates may be necessary depending upon weather conditions.

I will be using my personal vehicle as transportation to and from the above activity. I currently hold a valid driver's license in the state of _____

The license number is as follows: _____. I understand that in using my own vehicle I am traveling at my own risk. In the event of an accident, my own auto insurance will be the primary policy which will cover physical damage to my vehicle, as well as bodily injury and property damage to others. I hereby release and forever discharge Moravian College, its directors, agents, servants, and employees of and from any and all manner of actions, causes of action, suits, damages, claims, and demands, on account of personal injury, including, death, or any other cause whatsoever, which I may have against them by reason of or arising out of my participation in the above listed program.

Signature of Student Driver

MEDICAL EXCUSE NOTE POLICY

Moravian College

Introduction:

A *Statement of Absence from Class* form can be found on the back of this paper or it can be requested by e-mailing your instructor.

Moravian College Rationale:

This policy is congruent with those campuses nationwide that recognize the adult relationship between college students and their instructors. Attendance/participation policies related to specific courses should be outlined in class syllabi and communicated to students by their instructors. Sickness is only one of the many reasons that a student may not attend class. Ultimately, attending class is the responsibility of a student. The Health Care providers at the Health Center cannot be expected to write excuse notes for illnesses or problems for which we have never provided care. A student request for a note stating “I was sick last week (or last month) and could not attend class” is unreasonable!

Moravian College Policy:

- An excuse note will be written only in a case where the student has been treated by one of our providers and they have deemed it necessary for the student to be out of class. Under no circumstances will the diagnosis be placed on the note unless requested by the student.
- If the illness is over a prolonged period (over 3 days) Learning Services will be notified who then in turn will e-mail each of the student’s professors. Details will only be given with the student’s permission.
- Students frequently have medical, psychological conditions, illnesses or injuries that may cause them to miss class. These situations will be handled individually by our providers if they are involved in their care.
- In the event that a note is required by the professor in cases other than the above circumstances, the following form should be filled out by the student and given to their professors. The Health Center **WILL NOT** be involved.

STATEMENT OF ABSENCE FROM CLASS
Moravian College

1. Student's Name: _____
2. Department/Course: Physics, EASC-130 Astronomy
3. Date of Absence: _____
4. Instructor: Gary A. Becker
5. Reason for Absence: _____
6. In case of absence due to illness, answer the following:
 - Did you visit the Health Center? _____
 - Did you see another Doctor? _____
 - Doctor's name _____
 - If your answers to (a) or (b) are "NO" please give the name of someone who can vouch for the fact that you were ill.

Name of person: _____

Phone number: _____

*I certify that the above facts to be true to the best of my knowledge and belief. **I give permission to my professor to verify that the above information is true.** Finally, I understand that I subject myself to disciplinary action in the event the above facts are found to be false.*

Signature: _____

Date: _____

Please be advised that falsifying excuses for an absence from classes, examinations, or other course requirements is considered a violation of the Academic Honesty Policy. Students found to have falsified an excuse will be charged with academic dishonesty. At a minimum, the penalty will be a zero for the assignment in question; however, course failure, suspension, or expulsion from the College, are other possible consequences of falsified absence notes.