

# Moravian College Astronomy—Fall 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

**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](http://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. 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
----- Aug 31, Sept. 1, 2015	1 M Tu	<b>Getting Started:</b> Collect money for books, course Syllabus and class routine, use of BASN, short presentation on <a href="http://www.astronomy.org">www.astronomy.org</a> , <b>What is Astronomy?</b> <b>Distill the word</b> to its basic meaning assignment.	<i>I</i> -Borrow binoculars if you do not already own one. Do not buy binoculars.
----- Sept. 2, Sept. 3, 2015	2 W Th	<b>Areas of Interest/Popular Misconceptions:</b> Five areas of focus in astronomy, <b>Test Your Visual Knowledge of Astronomy exercise.</b> <b>Harvard University's Misconceptions Test</b> (for fun), Astrology vs. Astronomy; Inverse Square Law, <b>Intro. vocabulary quiz</b>	<i>2-BASN:</i> Session 2: Popular Misconceptions in Astronomy <i>UDVG:</i> pp 6-7.
----- Sept. 7, Sept. 8, 2015	3 M Tu	<b>Popular Misconceptions: PHASES OF THE MOON:</b> Put phases in correct order, teacher/students demonstrate phases, phase worksheet, identify the phase at your birth, sample phases of the moon quiz, moon illusion, the blue moon. <b>Distill the definition exercise for eclipses.</b>	<i>3-BASN:</i> Session 2 pertaining to the moon <i>UDVG:</i> View from Earth, pp. 56-91. Read seriously.
----- Sept. 9, Sept. 10, 2015	4 W Th	<b>Eclipses of the Sun and the Moon: Lunar phase quiz.</b> PP presentation on eclipses focusing on the repetition of eclipses, the saros, and visual aspects of viewing eclipses, both solar and lunar. <b>Eclipse vocabulary quiz</b> at the end of the period.	<i>4-BASN:</i> Session 5, Eclipse vocabulary important. <i>RM:</i> Aspects and Motions of the Moon; Eclipses.

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Sept. 14, Sept. 15, 2015	5 M Tu	<b>Boyertown Planetarium: CLASS FROM 7-9 P.M.</b> Maps in Student Section of <i>BASN</i> . Know your teams' pickup location. Give yourself one hour to get there. <b>EARTH, SUN, MOON RELATIONSHIPS.</b> Introduction to the planetarium environment, lunar phases, lunar and solar eclipses in motion. <b>Constellations ID.</b>	<b>5-UDVG:</b> Constellations, pp. 328-480 (N. Hem. Only), Skim through some of the major constellations and enjoy. One hour. <b>BASN:</b> Read Appendix, pp. 637-to end <b>6-BASN:</b> Session 6 <b>RM:</b> Telescopes in Particular
----- Sept. 16, Sept. 17, 2015	6 W Th	<b>Telescopes:</b> Half hour: Reflectors and refractors, <b>Make a drawing through a telescope/analyze your experiences.</b> Half hour: PP—Economizing the size of telescopes, Identifying different types of telescopes lab. <b>Understanding how Moravian's telescopes and mounting systems operate.</b>	<b>6-BASN:</b> Session 6 <b>RM:</b> Telescopes in Particular
----- Sept. 21, Sept. 22, 2015	7 M Tu	<b>Telescopes:</b> Hour Presentation: The physics and nature of light, as it applies to telescopes. The telescopes of Galileo and Newton. <b>Disassembling and assembling Moravian's portable telescopes and making an observation.</b> Students distribute fliers.	<b>7-BASN:</b> Session 6 <b>RM:</b> Telescopes in General
----- Sept. 23, Sept. 24, 2015	8 W Th	<b>Telescopes/Lunar Eclipse Review: Bart's comet quiz.</b> Detailed discussion of Sunday's eclipse. Dry run for Sunday's eclipse. Set up breakdown telescopes and make observations. Bad weather, 400 Years of the T/Invisible Universe.	<b>8-BASN:</b> Session 6 <b>RM:</b> Telescopes in General and Telescopes in Particular
----- Sept. 27 ----- Sept. 28, Sept. 29, 2015	Su 9 M Tu	<b>TOTAL LUNAR ECLIPSE—9:12 pm (10:49) 12:25 am</b> <b>At the Boyertown Area Sch. Dist. Planet.:</b> <b>Seasonal Observations from Different Latitudes, Stonehenge,</b> Constellation identification if time permits.	<b>College Hosts Public</b> <b>9-BASN:</b> Sessions 2 Section pertaining to the seasons <b>RM:</b> A Sky for all Seasons
----- Sept. 30, Oct. 1, 2015	10 W Th	<b>Popular Misconceptions: UNDERSTANDING THE SEASONS</b> (various demonstrations/teacher and students), <b>Geometry of the Seasons lab</b> completed in class. <b>Traditions of the Sun</b> web assignment discussed. .	<b>10-BASN:</b> Sessions 2 pertaining to the seasons <b>RM:</b> A Sky for all Seasons
----- Oct. 5, Oct. 6, 2015	11 M Tu	<b>Dark Sky Observing at Shooting Star Farm, Ghost Mountain: Dress Warmly!</b> 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 pm p.m., EDT. Bring binoculars/Finger Angles lab <b>Primary: Mon., Oct. 5— Tues., Oct. 6</b> <b>Secondary: Wed., Oct. 7— Thurs., Oct. 8</b>	<b>11-BASN:</b> Session 16 Review Finger Angle lab <b>UDVG:</b> Constellations, pp. 328-431 (N. Hem.), skim, enjoy
		--- F A L L B R E A K --- Wed., Oct. 14— Thurs., Oct. 15 Mon., Oct. 19— Tues., Oct. 20 ---Pupils arrive, 6:30 pm, EDT---	

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Oct. 7, Oct. 8, 2015	12 W Th	<b>Seasons Laboratory Exercise:</b> Students show graphically seasonal effects from different latitudes and answer questions pertaining to the altitude graphs they have constructed. Other misconceptions discussed.	<i>12-BASN:</i> Sessions 3 and 4 <i>RM:</i> Aspects and Motions of the Moon, Eclipses.
Fall Break Week		<b>F A L L B R E A K !</b> No classes <b>Monday-Tuesday, October 12, 13</b> Not long enough...	<b>FALL BREAK</b>
----- Oct. 14, Oct. 15, 2015	13 W Th	<b>Archaeoastronomy: Save Your People, Win That Girl</b> completed in class. Teams construct working calendars derived from astronomical observations. Pupils present examples of calendar construction. <b>PowerPoint: Focusing on Chaco Culture —Pueblo Bonito and A Picture is Worth 1000 Words</b> exercises. <b>Cheat Sheet for Exam 1 Distributed</b>	<i>13 RM:</i> Article on the Chaco Phenomenon
----- Oct. 19, Oct. 20, 2015	14 M Tu	<b>Catch up Class: THERE WILL BE CLASS.</b> <b>If the weather looks bad for Monday and Tuesday, we will hold the Shooting Star Dark Sky event at this time.</b> This free date will allow your instructor to bring the syllabus more in line with the lessons.	<i>14-TBA:</i>
----- Oct. 21, Oct. 22, 2015	15 W Th	<b>EXAM ONE on lessons 1-14: View From the Earth.</b> The exam weight will be equal to approximately 65 points. Student driven review for the first 30 minutes of class, two-hour exam. Students may stay longer. <b>Class period starts at 6:30 p.m.</b>	<i>15-</i> Review necessary materials in your texts. Write out questions for discussion. Study cheat sheet in group sessions for better brainstorming.
----- Oct. 26, Oct. 27, 2015	16 M Tu	<b>Characteristic of Main Sequence Stars/Determining the Distances to Stars:</b> Basic characteristic of main sequence stars, apparent and absolute magnitudes, the skinny triangle and parallax, the parsec, <b>Calculating Distances from Parallax Angles lab</b> featuring significant numbers. This lesson helps to clarify the “Y” axis of the Hertzsprung-Russell diagram	<i>16-BASN:</i> Session 14
----- Oct. 28, Oct. 29, 2015	17 W Th	<b>Distance Modulus Laboratory Exercise featuring the: Great Summer Triangle.</b> This lesson concludes the explaining of the Y-axis of the Hertzsprung Russell diagram and allows students to understand how to determine the absolute magnitude of stars.	<i>17-BASN:</i> Session 14 <i>UDVG:</i> Milky Way, Stars 224-231
----- Nov. 2, Nov. 3, 2015	18 M Tu	<b>Information from Starlight—Doppler shift, black body radiation curves, colors of stars, Wien’s and Steffan’s laws, Kirchhoff’s laws, the Bohr atom revealed through emission spectroscopy.</b> Moravian campus tour viewed through “fireworks” glasses. <b>Quiz on Session 14 vocabulary.</b>	<i>18-BASN:</i> Session 14

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Nov. 4, Nov. 5, 2015	19 W Th	<b>Spectral Emission and Spectral Absorption</b> <b>Classification Labs:</b> (two labs) Students learn to identify element from emission spectra— <b>emission identification quiz</b> . Absorption spectroscopy lab—student identify the spectral classifications of main sequence stars by identifying their spectra through line intensity ratios of standard elements. This lesson clarifies the X-axis of the Hertzsprung Russell diagram.	<i>19-BASN:</i> Session 14 <i>UDVG:</i> Milky Way, pp. 232-269
----- Nov. 9, Nov. 10, 2015	20 M Tu	<b>Construction of a Hertzsprung-Russell Diagram:</b> (lab) Students will construct an accurate color-coded representation of an H-R Diagram from the 30 brightest stars and the 30 nearest stars as seen from the Earth and to discover some basic conclusions about stars. Includes a worksheet associated with the lab...	<i>20-BASN:</i> Session 14 <i>UDVG:</i> Milky Way, pp. 232-269.
----- Nov. 11, Nov. 12, 2015	21 W Th	<b>Stellar Evolution and the H-R Diagram:</b> 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. How are the ages of star clusters determined? Why are some stars is variable?	<i>21-BASN:</i> Session 14 <i>UDVG:</i> Milky Way, pp. 270-291
----- Nov. 16, Nov. 17, 2015	22 M Tu	<b>Solar System Characteristics:</b> Definition of selective vocabulary words, Graphical Understanding of SS Characteristics, SS characteristics discussed, Kepler's three laws of planetary motion, Ellipse lab—sketch an orbit, angular momentum, universal gravitation.	<i>22-BASN:</i> Session 7, review insert section. <i>UDVG:</i> SS, pp. 114-119. <i>RM:</i> Nine Planets
----- Nov. 18, Nov. 19, 2015	23 W Th	<b>Introduction to the Solar System:</b> Invasion of the Sarbra People lab, 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.	<i>23-BASN:</i> Session 7, review insert section. <i>UDVG:</i> SS, pp. 114-119. <i>RM:</i> Nine Planets
----- Nov. 23, Nov. 24, 2015	24 M Tu	<b>Catch up Class: THERE WILL BE CLASS.</b> This free date will allow your instructor to bring the syllabus more in line with the lessons.	Texts: BASN/UDVG/RM <i>14-TBA:</i>
----- Nov. 25, Nov. 26, 2015	---- W Th	<b>T H A N K S G I V I N G   B R E A K</b> No classes Wednesday/Thursday, November 25, 26 We are almost there!	<b>THANKSGIVING BREAK</b>
----- Nov. 30, Dec. 1, 2015	25 M Tu	<b>Comparative Planetology—The Earth:</b> Atmosphere and its circulation; earthquakes, interior structure, and differentiation; plate tectonics, magnetic field, amount of volatiles contained within the Earth. Plate Tectonics Lab.	<i>25-BASN:</i> Session 8, review insert section. <i>UDVG:</i> SS, pp. 138-147.

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
----- Dec. 2, Dec. 3, 2015	26 W Th	<b>Comparative Planetology—The Moon and Mercury:</b> Survival on the Moon lab, tidal forces, formation and evolution, lunar physical features, how the moon changes, likenesses and differences between Mercury and the moon's evolution. Apollo: when we went to the moon if time permits.	<b>26-BASN:</b> Session 9, review questions. <b>UDVG:</b> SS, pp. 148-159.
----- Dec. 7, Dec. 8, 2015	27 M Tu	<b>Mars:</b> Explore Mars surface features 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, the Mars Habitat—living on Mars <b>Cheat Sheet for the second exam distributed</b>	<b>27-BASN:</b> Session 10, review questions on Mars. <b>UDVG:</b> SS, pp.160-175.
----- Dec. 9, Dec. 10, 2015	28 W Th	<b>Outer Solar System Revealed</b> —Jupiter and Saturn emphasized, Uranus and Neptune compared. Strange worlds and even stranger moons discussed.	<b>27-BASN:</b> Session 11
----- Dec. 14, Dec. 15, 2015	29 M Tu	<b>SECOND EXAM on lessons 15 through 28:</b> Same weight as the first exam (65 points). Student driven review for the first 30 minutes of class, two-hour exam. Students may stay longer. <b>Class period starts at 6:30 p.m.</b>	<b>Happy Winter Break!</b>  <b>WE MADE IT!</b>

**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
<b>Total Penalty Applied</b>		<b>-1</b>	<b>-3</b>	<b>-7</b>	<b>-15</b>	<b>-31</b>	<b>-63</b>		<b>-127</b>	<b>--YOU FAIL--</b>

**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.

**Laptops/Notebooks** 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 must contact Laurie Roth ([rothl@moravian.edu](mailto:rothl@moravian.edu)), 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.

**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](mailto:wilsond@moravian.edu)), Tutor Coordinator, for more information about tutoring.

**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.

**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: Email counts as "in 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)

September 1, 2015



# 2016 CALENDAR

JANUARY						
M	T	W	T	F	S	S
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FEBRUARY						
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MARCH						
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APRIL						
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MAY						
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<sup>23</sup> <sub>30</sub>	<sup>24</sup> <sub>31</sub>	25	26	27	28	29

JUNE						
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JULY						
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AUGUST						
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SEPTEMBER						
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OCTOBER						
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<sup>24</sup> <sub>31</sub>	25	26	27	28	29	30

NOVEMBER						
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DECEMBER						
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<http://freewordtemplates.net/>

**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 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](http://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  
August 11, 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:**

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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](http://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](mailto:garyabecker@gmail.com) or [beckerg@moravian.edu](mailto:beckerg@moravian.edu).