

## Moravian College Astronomy—EASC-130

Fall/Spring Term 2012/13—Tuesdays/Thursdays 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/Tuesdays-Thursdays 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 each text will be supplied by your instructor at no cost. The *Astronomy Survival Notebook* is your main textbook and it is yours to keep. The reading manual is also yours to keep if you wish. *Universe* is for supplemental reading assignments and may not be marked up in any way. **Students will always bring to class their Astronomy Survival Notebook, a calculator, a flashlight and a Smart/Cell Phone.** Your smart phone may be substituted for a calculator (non-exam situation), as well as a flashlight. *Universe: A Definitive Visual Guide* and the reading manual do not have to be brought to class. If you own or can borrow binoculars, bring them to class on nights when observing will take place. Please do not buy binoculars for this class.

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

Date	CI	Topics of Discussion	Texts: BASN/UDVG/RM
Aug-28, 2012 Jan-15, 2013	1 Tu	<b>Getting Started:</b> Course Syllabus and class routine, use of BASN, presentation on <a href="http://www.astronomy.org">www.astronomy.org</a> , <b>What is Astronomy?</b> Distill the word to its basic meaning.	Borrow binoculars if you do not already own one. Do not buy binoculars.
Aug-30, 2012 Jan-17, 2013	2 Th	<b>Popular Misconceptions:</b> Five areas of focus in astronomy, <b>Test Your Visual Knowledge</b> of Astronomy exercise. Harvard University's Misconceptions Test (for fun), Astrology vs. Astronomy; Inverse Square Law, Earth, sun, moon relationships—lunar phases, seasons demonstrated (teacher/student), Vocabulary quiz	<b>BASN:</b> Session 2: Popular Misconceptions in Astronomy <b>UDVG:</b> pp 6-7. <b>Session One vocabulary quiz</b>
Sept-4, 2012 Jan-22, 2013	3 Tu	<b>At the Kutztown University Planetarium:</b> Students carpool. Know where your team's pickup point is located. Give yourself at least an hour to get to the planetarium. Maps are provided. Introduction to the planetarium environment, seasonal effects from home and different latitudes, lunar phases, north circumpolar constellations. <b>CLASS WILL RUN FROM 7-9 P.M.</b>	<b>UDVG:</b> Constellations, pp. 328-480 (N. Hem. Only), Skim through some of the major constellations and enjoy. Give yourself an hour for this assignment.
Sept-6, 2012 Jan-24, 2013	4 Th	<b>Popular Misconceptions/Archaeoastronomy:</b> Seasons lab introduced but some graphing completed as homework, <b>Light my Pole</b> assignment given depending upon time. <b>Traditions of the Sun</b> web assignment-write 10 questions.	<b>BASN:</b> Session 2 and 3 <b>RM:</b> A Sky for all Seasons.

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
<b>Sept-11, 2012</b> <hr/> Jan-29, 2013	<b>5 Tu</b>	<b>Archaeoastronomy:</b> Phases of the moon quiz, <b>Save Your People, Win That Girl</b> completed in class, <b>PP—Archaeoastronomy: Focusing on Chaco Culture. Pueblo Bonito</b> exercise, Video: The Mystery of Chaco Canyon, if time permits.	<b>UDVG:</b> View from Earth, pp. 56-91. Read seriously. <b>BASN:</b> Session 3 <b>RM:</b> A Sky for all Seasons.
<b>Sept-13, 2012</b> <hr/> Jan-31, 2013	<b>6 Th</b>	<b>Archaeoastronomy: Seasons Lab</b> questions considered, <b>PP—Archaeoastronomy: Focusing on Chaco Culture</b> —part two, <b>Picture is Worth 1000 Words</b> exercise, Introducing the Equatorial Coordinate System and graphing the changing position of the moon.	<b>BASN:</b> Session 3: Read vocabulary list <b>RM:</b> A Sky for all Seasons.
<b>Sept-18, 2012</b> <hr/> Feb-5, 2013	<b>7 Tu</b>	<b>Archaeoastronomy:</b> Complete focus on seasons and Earth motions through archaeoastronomy unit. <b>Equatorial Coordinate System Lab:</b> Pupils locate current positions of planets, sun, and moon in the sky or plot a month of lunar position to become familiar with right ascension and declination.	<b>BASN:</b> Review Session 3, Read, A Brief Review of Coordinate Systems.
<b>Sept-20, 2012</b> <hr/> Feb-7, 2013	<b>8 Th</b>	<b>At ASD Planetarium:</b> Students carpool in teams. <b>Stonehenge</b> decoded, <b>Coordinate Systems:</b> Altitude and azimuth, latitude and longitude, equatorial coordinate system, precession, time, celestial navigation lab introduced, constellations if time permits.	<b>BASN:</b> Session 2 and 4 <b>UDVG:</b> Constellations, pp. 328-480 (N. Hem. Only), Skim for an hour and enjoy.
<b>Sept-25, 2012</b> <hr/> Feb-12, 2013	<b>9 Tu</b>	<b>Celestial Navigation Lab:</b> 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.	<b>BASN:</b> Session 5, get familiar with eclipse vocabulary. Eventually there will be a vocabulary quiz.
<b>Sept-27, 2012</b> <hr/> Feb-14, 2013	<b>10 Th</b>	<b>At ASD Planetarium: Lunar and Solar Eclipses</b> Students carpool in teams. Basic eclipse terminology, repetition of eclipses, the saros, demonstrations of parameters which influence eclipses, chasing eclipses, planetary motions, and configurations, constellations. Video: The Great Eclipse.	<b>BASN:</b> Session 5 <b>RM:</b> Aspects and Motions of the Moon; Eclipses.
<b>Oct-2, 2012</b> <hr/> Feb-19, 2013	<b>11 Tu</b>	<b>Telescopes:</b> The physics of light, Different types of telescopes, economizing the size of telescopes, telescopes at a glance. <b>Draw the Star of Bethlehem with a telescope to obtain a perspective on what it is like to use a telescope.</b>	<b>BASN:</b> Session 6 <b>RM:</b> Telescopes in General and Telescopes in Particular

Date	Cl	Topics of Discussion	Texts: BASN/UDVG/RM
<p><b>Oct-4, 2012</b>  <hr/>                     Feb-21, 2013</p>	<p><b>12 Th</b></p>	<p><b>At ASD Planetarium:</b> Students carpool in teams. The fourth evening at the ASD Planetarium will deal specifically with the <b>constellations and the nighttime sky</b> and other presentations that were not completed because of time constraints. Aligning a telescope to the equatorial coordinate system.</p> <p><b>Mid-term grades due at this time.</b></p>	<p><b>UDVG:</b> Constellations, pp. 328-480 (N. Hem. Only), Skim through some of the major constellations and enjoy. Give yourself an hour for this assignment.</p>
<p><b>Oct-5- Oct-10, 2012</b></p>		<p style="text-align: center;"><b>F A L L B R E A K !</b>  <b>No class on Oct. 9, 2012</b></p>	<p style="text-align: center;"><b>FALL BREAK</b></p>
<p><b>Oct-11, 2012</b>  <hr/>                     F-26, 2013</p>	<p><b>13 Th</b></p>	<p><b>Dark Sky Observing at Bill Jacobs’s Farm, Ghost Mountain:</b> Lessons nine and ten could be reversed depending upon weather conditions. Arrive at the farm no later than (see below). <b>Dress Warmly!</b> Bring binoculars if you have them. Constellations, view deep sky objects with telescopes, we’ll also calculate the number of stars visible from Bill’s farm.</p> <p><b>Primary:</b> Th., Oct. 11—arrive, 6:30 pm,  <b>Secondary:</b> Tu., Oct. 16—arrive, 6:30 pm,                      Th., Oct. 18—arrive, 6:30 pm,</p>	<p><b>BASN:</b> Session 16  <b>UDVG:</b> Constellations, pp. 328-431 (N. Hem.), skim, enjoy—repeated from Jan. 28 readings</p>
<p><b>Oct-16, 2012</b>  <hr/>                     Feb-28, 2013</p>	<p><b>14 Tu</b></p>	<p><b>Day Star Sun:</b> It is all about magnetism, “surface features,” sunspot cycle, internal structure, proton-proton reaction, <math>E = mc^2</math>.                      Bart’s quiz on telescopes will end the lesson.</p>	<p><b>BASN:</b> Session 13-14  <b>UDVG:</b> pp. 120-123. pp. 230-261.</p>
<p><b>M-2-11, 2013</b></p>		<p style="text-align: center;"><b>S P R I N G B R E A K !</b>  <b>No Classes March 5 and March 7, 2013</b></p>	<p style="text-align: center;"><b>SPRING BREAK</b></p>
<p><b>Oct-18, 2012</b>  <hr/>                     Mar-12, 2013</p>	<p><b>15 Th</b></p>	<p><b>Stars:</b> Basic characteristic of hydrogen burning stars, apparent and absolute magnitudes, parallax, parallax lab, distance modulus. The nature of light, temperature, black body curves, colors of stars, Bohr atom, Kirchhoff’s laws, fluorescence spectral lab. Absorption spectrum lab, construction of an H-R diagram lab.</p> <p><b>Exam review questions distributed.</b></p>	<p><b>BASN:</b> Session 14  <b>UDVG:</b> Milky Way, Stars 224-231</p>
<p><b>Oct-23, 2012</b>  <hr/>                     Mar-14, 2013</p>	<p><b>16 Tu</b></p>	<p><b>EXAM ONE on lessons 1-14:</b> The exam weight will be equal to 50 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.</p>	<p>Review necessary material in texts. Write out questions for discussion.</p>

<b>Date</b>	<b>Cl</b>	<b>Topics of Discussion</b>	<b>Texts: BASN/UDVG/RM</b>
<b>Oct-25, 2012</b> Mar-19, 2013	<b>17 Th</b>	<b>Stellar Evolution and the H-R Diagram:</b> What does an H-R diagram tell us; luminosity classifications, using the H-R diagram as a tool for understanding distance, stellar birth, life, variable stars: intrinsic and eclipsing.	<b>BASN:</b> Session 14 <b>UDVG:</b> MW, pp. 232-269.
<b>Oct-30, 2012</b> Mar-21, 2013	<b>18 Tu</b>	<b>Stellar Evolution:</b> Stellar old age, supernovae and the death of stars, white dwarfs, neutron stars, black holes, star clusters. Distance Modulus lab	<b>BASN:</b> Session 14 <b>UDVG:</b> MW, pp. 270-291.
<b>Nov-1, 2012</b> Mar-26, 2013	<b>19 Th</b>	<b>The Milky Way and the Fate of the Universe:</b> What is out Milky Way Galaxy all about, Big Bang not really a bang; cosmic microwave background, dark matter, dark energy, open or closed universe?	<b>BASN:</b> Session 15 <b>UDVG:</b> MW, pp. 292-325.
<b>Nov-6, 2012</b> Mar-28, 2013	<b>20 Tu</b>	<b>Introduction to the Solar System:</b> Vocabulary list, graphical understanding of SS characteristics, SS characteristics, Invasion of the Sarbra People, angular momentum, Kepler's three laws (ellipses), sketch an orbit.	<b>BASN:</b> Session 7, review insert section. <b>UDVG:</b> SS, pp. 114-119. <b>RM:</b> Nine Planets
<b>Nov-8, 2012</b> Apr-2, 2013	<b>21 Th</b>	<b>Introduction to the Solar System:</b> Universal gravitation, magnetic fields, volatile versus refractory materials, stellar birth, a possible sequence of events for the origin of the solar system, meteoritic science, calculating the mass of Jupiter.	<b>BASN:</b> Session 7, review insert section. <b>UDVG:</b> SS, pp. 114-119. <b>RM:</b> Nine Planets
<b>Nov-13, 2012</b> Apr-4, 2013	<b>22 Tu</b>	<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.	<b>BASN:</b> Session 8, review insert section. <b>UDVG:</b> SS, pp. 138-147.
<b>Nov-15, 2012</b> Apr-9, 2013	<b>23 Th</b>	<b>Comparative Planetology—The Moon:</b> 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.	<b>BASN:</b> Session 9, review questions. <b>UDVG:</b> SS, pp. 148-159.
<b>Nov-20, 2012</b> Apr-11, 2013	<b>24 Tu</b>	<b>Comparative Planetology:</b> Volcanism and cratering in the solar system; explore Venus via computer and then onto Mars	<b>UDVG:</b> SS, pp. 124-138,
<b>Nov-20</b> <b>Nov-26</b> <b>2012</b>		<b>THANKSGIVING BREAK</b> <b>Begins at 10 p.m., Tuesday, Nov. 20</b>	

<b>Date</b>	<b>CI</b>	<b>Topics of Discussion</b>	<b>Texts: BASN/UDVG/RM</b>
<b>Nov-27, 2012</b> <u>Apr-16, 2013</u>	<b>25 Tu</b>	<b>Mars:</b> 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 make their marks; Mercury and Venus possibly.	<b>BASN:</b> Session 10, review questions. <b>UDVG:</b> SS, pp.160-175.
<b>Nov-29, 2012</b> <u>Apr-18, 2013</u>	<b>26 Th</b>	<b>Outer Solar System:</b> Jupiter will never be a star, internal structure, magnetic field, atmospheric circulation, ring systems, focus on Saturn, interesting moons of the outer planets, dwarf planets.	<b>BASN:</b> Session 11, review questions. <b>UDVG:</b> SS, pp. 176-203.
<b>Dec-4, 2012</b> <u>Apr-23, 2013</u>	<b>27 Tu</b>	<b>Small Solar System Bodies:</b> Let’s build a comet; anatomy of a comet, morphology, naming comets, great comets, meteors, meteor showers, meteorites and how they tell us about the early solar system, asteroid flybys.	<b>BASN:</b> Session 12 <b>UDVG:</b> SS, pp. 204-223.
<b>Dec-6 2012</b> <u>Apr-25 2013</u>	<b>28<sup>Th</sup></b>	<b>Don’t get any ideas. There will be class. I always run late with the syllabus and this will give us a little breather if that happens or if we have an evening cancelled because of inclement weather.</b>	
<b>Dec-11, 2012</b> ----- <u>Apr-30, 2013</u>	<b>29 Tu</b>	<b>SECOND EXAM on lessons 13, 16 through 28:</b> Same weight as the first exam (50 points) if there are only two exams. Student driven review for the first hour of class, two-hour exam limit. Class period starts at 6:30 p.m.	<b>Happy Holidays</b> <b>Happy Summer!</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 and real time astronomical observations.
5. To provide the type of classroom experience in which a nonscience oriented individual feels that he or she has the opportunity to succeed.

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

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

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

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

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

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

Classes Missed:	0	1	2	3	4	5	6	EVENT	7	<b>BLACK HOLE</b>
Penalty Deduct:	+10	-1	+ -2	+ -4	+ -8	+ -16	+ -32	HORIZON	-64	<b>OF DEATH</b>
<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>

**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 basic and plain English: You cheat, you get caught, and you will fail the exam or maybe even the course. You may even be forced by Moravian College to change your major.

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

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

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

**Electronic Recordings of Class Presentations** are not permitted, and violators will be prosecuted.

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

**Observation Sessions:** From time to time class observations will be made from the Collier Rooftop Observatory. At least one class session will be devoted to observing the heavens from a dark site. Conditions can be windy and cold especially during late fall, winter, and early spring. On clear nights, students should bring to class extra protection 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)

\*\*\* BECKER'S \*\*\*

# ASTRONOMY SURVIVAL NOTEBOOK

## MORAVIAN COLLEGE STUDENT FOREWORD

ASTRONOMY, as the author of this book teaches it, is an elective 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 solar system and its formation, and the life history of stars. A myriad of topics come into play when those three focus areas are considered. Specific lessons can be seen by visiting the syllabus which outlines the order in which course material 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 simply exercises in mathematics with the instructor completing the lesson to an audience turned off and fast asleep. 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 that you will be enrolled in continue to evolve. Students are encouraged to consider the book as a working copy and to make suggestions for its improvement. Although the classes 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 order to get the most from this course, 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*, *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 course and much success as we journey to the stars. Ad Astra!

Gary A. Becker  
August 20, 2012

\*\*\* 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: topics on misconceptions, archaeoastronomy (astronomy of the ancients), instrumentation, eclipses, the evolution and current status of the solar system, and the life and death of stars. Students will also gain familiarity with the night sky through planetarium visits and observations.

### **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 and real time astronomical observations.
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. A participation grade will then be added to this numerical percentage to produce the final grade. Quarter grades will be accrued from the following criteria:

1. **Examinations:** There will be two examinations. The second test will occur on the night of the final exam. They will not be cumulative. The tests will be mainly objective in nature and compiled from classroom discussions. The exams will be difficult and because of their infrequency, each exam will carry a much greater weight in determining 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 5-15 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 and clarity, as well as 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. This could be as much as 50%. After one week, it's a 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 circumstances. Failure to complete assignments within a reasonable time will result in a reduced grade or a grade of zero.
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 class discussions.
7. **Free Points:** Students can accumulate free points from the introductory classroom 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.
  - b. Your *Astronomy Survival Notebook* should be brought to every class. It is your main text for the course.
  - d. 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.
  - e. The replacement value of a lost *Astronomy Survival Notebook* is \$20.00.
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

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E-mail: [garyabecker@gmail.com](mailto:garyabecker@gmail.com) or [garyabecker@moravian.edu](mailto:garyabecker@moravian.edu)

Home Page: [www.astronomy.org](http://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 calculator, and a flashlight. Smart phones may qualify for the latter two applications, except when an exam is given.

**FORMULA FOR SUCCESS:**

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 your teacher considers important.
2. **Use your text, libraries, the Internet, and astronomy instructor as resource avenues.** Your astronomy instructor is ready and willing to assist you in any reasonable manner to help your progress in this course. He enjoys his subject and wants you to succeed.
3. **Possess some mathematical skills** (at least through algebra).
4. **Study** for exams over a period of several days.
5. **Participate** in classroom activities, take notes, and ask questions, when in doubt.
6. **Complete assignments on time** and laboratory exercises in a neat and orderly fashion.
7. **Attend class** regularly. You miss class; you miss out!
8. **Kindly consider practicing The Golden Rule: *Do unto others as you would have others do unto you.*** Treat your peers and instructor with respect and your teacher will have no trouble returning that same respect to you.
9. **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! Be the best that you can be, and you will make me the best teacher that I can be. We'll have a great experience while learning astronomy together.**

**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 me to see what you have missed. I can be reached at 610-390-1893 or [garyabecker@gmail.com](mailto:garyabecker@gmail.com) or [garyabecker@moravian.edu](mailto:garyabecker@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.



**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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**ASTRONOMY CLASS ASSIGNMENT AND ACTIVITY SHEET**

Due Date	Activity or Assignment

**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: \_\_\_\_\_

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 complete 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: \_\_\_\_\_

