

Moravian College Astronomy—EASC-130

Fall/Spring Term 2011/12—Tuesdays/Thursdays 6:30 p.m. to 9:30 p.m.

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

Office: 113 Collier/Tuesdays-Thursdays 6 pm/or by appointment; office or astronomy lab

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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* (copy supplied by instructor \$20.00 fee), *Universe: The Definitive Visual Guide*, General Editor, Martin Rees. A lender copy will be supplied by your instructor for free. Signed out books may not be marked up in any way. Students will be assigned an **Astronomy Tool Kit**. The kit will include a calculator, a pen, several lead pencils, five different colored pencils (preferred-RYGBV), a good eraser, metric ruler, protractor, compass, a small flashlight or preferably a headlamp, an extra set of batteries. This kit is worth about \$50 and will be your responsibility not to lose items. If you own or can borrow binoculars, bring them on clear nights. Don't buy binoculars. *Universe: A Definitive Visual Guide* does not have to be brought to class.

About this Syllabus: Consider this syllabus an evolving/working document to help 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
Aug-29, 2011 ----- Jan-17, 2012	1	Getting Started: Course Syllabus and class routine, use of BASN, www.astronomy.org , What is Astronomy? Distill the word to its basic meaning. Test Your Visual Knowledge of Astronomy exercise.	Get your astronomy tool kit together. Borrow a pair of binoculars if you do not already own one.
Sept-1, 2011 ----- Jan-21, 2012	2	Popular Misconceptions: Session one vocabulary quiz, Harvard University's Misconceptions Test (for fun), Astrology vs. Astronomy; Inverse Square Law, Earth, sun, moon relationships—seasons demonstrated (teacher/student), Traditions of the Sun web assignment.	BASN: Session 1 and 2 UDVG: pp 6-7.
Sept-6, 2011 ----- Jan-24, 2012	3	Archaeoastronomy: Seasons lab introduced but completed as homework, Save Your People, Win That Girl completed in class, Light my Pole assignment due Feb. 1,	BASN: Session 2 and 3 UDVG: View from Earth, pp. 56-91. Read seriously.
Sept-8, 2011 ----- Jan-26, 2012	4	At ASD Planetarium: Students carpool. Know where your team's pickup point is located. Introduction to the planetarium environment, seasonal effects from home and different latitudes, lunar phases, north circumpolar constellations.	BASN: Session 2 UDVG: Constellations, pp. 328-431 (N. Hem. only), Skim and enjoy.
Date	CI	Topics of Discussion	Texts: BASN/UDVG

Sept-13, 2011 ----- Jan-31, 2012	5	Archaeoastronomy: The Long Road to Chaco: Astronomy of the Ancestral Puebloans, Mysterious Pueblo Bonito exercise, Stonehenge decoded if time permits.	BASN: Session 3 UDVG: Constellations, pp. 410-431 (N. Hem.). Skim and enjoy.
Sept-15, 2011 ----- Feb-2, 2012	6	At ASD Planetarium: Students carpool in teams. Altitude and azimuth, latitude and longitude, equatorial coordinate system, precession, time, celestial navigation lab, constellations.	BASN: Session 2 and 4 UDVG: Constellations, pp. 432-449 (N. Hem.). Skim and enjoy.
Sept-21, 2011 ----- Feb-6, 2012	7	Lunar and Solar Eclipses: Basic eclipse terminology, repetition of eclipses, the saros, chasing eclipses, equatorial coordinate system lab or assignment, pp 98-99.	BASN: Session 6, get familiar with vocabulary. UDVG: Constellations, pp.450-467 (N. Hem.). Skim and enjoy.
Sept-22, 2011 ----- Feb-8, 2012	8	At ASD Planetarium: Students carpool in teams. Demonstrations of parameters which influence eclipses, planetary motions, and configurations, constellations.	BASN: Session 6 UDVG: Constellations, pp. 468-485 (N. Hem.). Skim and enjoy
Sept-27, 2011 ----- Feb-14, 2012	9	Telescopes: Knowing your telescope, economizing the size of telescopes, telescopes at a glance. Class starts 6:30 p.m. on rooftop observatory viewing Jupiter and the moon. Bring your binoculars. We might even try a class photo by moonlight if it's not too windy.	BASN: Session 5 UDVG: Exploring Space, pp. 80-111. Read two handouts on telescopes seriously.
Sept-29, 2011 ----- Feb-16, 2012	10	EXAM on lessons 1-10: Student driven review for the first hour of class, two-hour exam limit.	Review necessary material in texts. Write out questions for discussion.
Oct-4, 2011 ----- Feb-21, 2012	11	Introduction to the Solar System: Vocabulary list, graphical understanding of SS characteristics, SS characteristics, Invasion of the Sarbra People, angular momentum, Kepler's three laws (ellipses), sketch an orbit.	BASN: Session 7, review insert section. UDVG: SS, pp. 114-119.
Oct-6, 2011 ----- Feb-23, 2012	12	Introduction to the Solar System: 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.	BASN: Session 7, review insert section. UDVG: SS, pp. 114-119.
Oct-8- Oct-11, 2011		F A L L B R E A K !	
Date	Cl	Topics of Discussion	Texts: BASN/UDVG

Oct-11, 2011 ----- Feb-28, 2012	13	Comparative Planetology—The Earth: Atmosphere and its circulation; earthquakes, interior structure, and differentiation; plate tectonics, magnetic field, amount of volatiles contained within the Earth.	BASN: Session 8, review insert section. UDVG: SS, pp. 138-147.
Oct-13, 2011 ----- Mar-1, 2012	14	Dark Sky Observing at Bill Jacob’s Farm, Ghost Mountain: Arrive at the Jacob’s Farm no later than 6:30 p.m. Dress Warmly. Bring binoculars if you have them. Tour of the constellations, view deep sky objects with telescopes, we’ll also calculate the number of stars visible from Bill’s farm. Rain/Snow dates: Mar. 22/24, Mar. 29/31, Apr. 5/7. Meet at 7:30 p.m. We will definitely get a clear night on one of these evenings.	BASN: Session 16 UDVG: Constellations, pp. 328-431 (N. Hem.), skim, enjoy—repeated from Jan. 28 readings.
M-5-11, 2012		SPRING BREAK!	
Oct-18, 2011 ----- Mar-13, 2012	15	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.	BASN: Session 9, review insert section. UDVG: SS, pp. 148-159.
Oct-20, 2011 ----- Mar-15, 2012	16	Comparative Planetology: Volcanism and cratering in the solar system; explore Venus via computer.	BASN/UDVG: Cumulative review of appropriate readings.
Oct-25, 2011 ----- Mar-20, 2012	17	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 make their marks; Mercury and Venus possibly.	BASN: Session 10, review insert section. UDVG: SS, pp. 124-138, & pp.160-175.
Oct-27, 2011 ----- Mar-22, 2012	18	Outer Solar System: 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.	BASN: Session 11, review insert section. UDVG: SS, pp. 176-203.
Nov-1, 2011 ----- Mar-27, 2012	19	Small Solar System Bodies: 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.	BASN: Session 12 UDVG: SS, pp. 204-223.
Nov-3, 2011 ----- Mar-29, 2012	20	EXAM on lessons 11-19: Student driven review for the first hour of class. Two-hour limit on the exam. If March 31 is the first clear night after the original Jacobs Farm observing date, the exam will be postponed until Apr. 5.	Review necessary material in texts. Write out questions for class discussion.
Date	Cl	Topics of Discussion	Texts: BASN/UDVG

Nov-8, 2011 ----- Apr-3, 2012	21	Day Star Sun: Observe the sun, 6:30 p.m. weather permitting—Collier rooftop; it’s all about magnetism, “surface features,” sunspot cycle, internal structure, proton-proton reaction, $E = mc^2$.	BASN: Session 13 UDVG: SS, pp. 120-123.
Nov-10, 2011 ----- Apr-5, 2012	22	Stars: Basic characteristic of hydrogen burning stars, apparent and absolute magnitudes, parallax, distance modulus.	BASN: Session 14 UDVG: MW, pp. 230-245.
Nov-15, 2011 ----- Apr-10, 2012	23	Stars: The nature of light, temperature, black body curves, colors of stars, Bohr atom, Kirchhoff’s laws, fluorescence spectral lab.	BASN: Session 14 UDVG: MW, 246-261.
Nov-17, 2011 ----- Apr-12, 2012	24	Stars: Spectroscopy quiz, absorption spectrum lab, construction of an H-R diagram.	BASN: Session 14 UDVG: Cumulative review of readings.
Nov-22, 2011 ----- Apr-17, 2012	25	Stellar Evolution and the H-R Diagram: 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.	BASN: Session 14 UDVG: MW, pp. 270-289.
Nov-23 Nov-27 2011		THANKSGIVING BREAK	
Nov-29, 2011 ----- Apr-19, 2012	26	Stellar Evolution: Stellar old age, supernovae and the death of stars, white dwarfs, neutron stars, black holes.	BASN: Session 14 UDVG: MW, pp. 262-269.
Dec-1, 2011 ----- Apr-24, 2012	27	The Fate of the Universe: Big Bang not really a bang; cosmic microwave background, dark matter, dark energy, open or closed universe?	BASN: Session 15 UDVG: MW, pp. 292-325.
Dec-6, 2011 ----- Apr-26, 2012	28	Don’t get your hopes up: TBA. There will be class for the normal amount of time. This is just a buffer to help make sure that all topics are covered or at least have a chance to be covered.	Review necessary material in texts. Write out questions for discussion.
Dec-13, 2011 ----- May-1, 2012	29	SECOND EXAM on lessons 11-28: Higher weight than the first exam since more material has been covered. Student driven review for the first hour of class, two-hour exam limit.	Happy Holidays ----- Happy Summer! WE MADE IT!

Goals of the Course: Read “Moravian Student Foreword,” Astronomy Course Objectives, found in your copy of ^{Becker’s} *Astronomy Survival Notebook*, pp. vi-vii. The course goals will also be discussed during the first class meeting.

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. vii-viii. Moravian’s +/- policy with regards to grading will also 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. Students’ grades will 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. This will 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. Pupils who miss a class will be expected to provide legitimate, documented proof about why they were absent to avoid penalty. The excuse must be valid for the day of absence. If you skip class after the break, I’ll consider you not having been present for any of the class period. A penalty structure for missed classes without proof of absence will be as follows:

Classes Missed:	0	1	2	3	4	5	6	EVENT	7	BLACK HOLE
Penalty Deduct:	+10	-1 +	-2 +	-4 +	-8 +	-16 +	-32 +	HORIZON	-64	OF DEATH
Total Penalty Applied		-1	-3	-7	-15	-31	-63		-127	--YOU FAIL—

Academic Honesty Policy: This will be followed as per the Moravian College Catalog 2010-2011, <http://www.moravian.edu/studentlife/handbook/academic/academic2.html>. Put in very Basic English: You cheat, you get caught, and you will fail the exam or maybe even the course.

Learning Disabilities: Any student who wishes to disclose a disability and request accommodations under the Americans with Disabilities Act (ADA) for this course should contact Mr. Joe Kempfer, Assistant Director of Learning Services for Disability support, 1307 Main Street (extension 1510). Accommodations cannot be provided until authorization is received from the office of Learning Services.

Cell Phones: Please turn off your cell phones when in class unless you are using a cell phone and a peripheral device to take and transmit notes during class. Using an electronic device in class to look up information pertinent to the discussion and in a non-testing situation will be permitted. If you absolutely need to use your phone during class for a private communication, kindly inform me about this situation and leave the classroom to make your call. **I consider text messaging friends during class, just plain rude and I may ask you to leave class.** During breaks, cell phone use is permitted. **Consider the educational process to be similar to live theater. The actors and audience need to concentrate in order to understand the plot.**

Electronic Recording of Class Presentations is not permitted.

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, you'll be responsible for cleaning it up!

Observation Sessions: From time to time class observations will be made from the Collier Rooftop Observatory. One class session will be devoted to observing at a dark site. Conditions can be windy and cold especially during the late fall, the winter, and the 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)

May 8, 2011

*** BECKER'S ***

ASTRONOMY SURVIVAL NOTEBOOK

MORAVIAN COLLEGE STUDENT FOREWORD

ASTRONOMY, as the author teaches it, is a science elective designed for students who have always wanted to know more about the macrocosm that surrounds them. The major areas of focus include: a thorough understanding of the solar system and stellar evolution. Additional topics will incorporate astronomical misconceptions, archaeoastronomy, eclipses, navigation, time, instrumentation, observational techniques, relativity, the fate of the universe, and constellation identification. Current events in the field of astronomy, student preferences, and teacher preferences can dictate the manner in which topics are presented during the semester. After four decades of astronomy instruction, I have yet to be convinced of a prescribed methodology for maximizing teaching efficiency. Generally, college textbook writers arrange their order of development outward, starting with Earth-centered topics. This is how I will present the material, but I also believe that an instructor can fundamentally start anywhere within the discipline and teach a good course.

A basic reason why pupils choose to elect this course over other subjects is because of their access to the Allentown School District Planetarium located at Dieruff High School. Students living in an urban environment want to know more about the universe that surrounds them. Becoming even a little familiar with the nighttime sky increases the enjoyment of learning astronomy because the attained knowledge becomes more personal. A student can look up into the sky and see what she or he has learned.

The astronomy course that you will be taking is designed for nonscience majors at the undergraduate college level. Although this astronomy course is mainly descriptive in nature, be prepared for some mathematics. Don't panic about this fact. We will get through it together. Keep a positive attitude, ask lots of questions when in doubt, and you will be on the fast track for success.

The Internet is an excellent tool for gaining valuable and particularly timely information about astronomy, but there is a catch. Much of the general, on-line material is poorly written with a copious amount of mistakes. To help with this dilemma, I have constructed a home page to be used along with this course and text. It can be accessed at www.astronomy.org. The links associated with *Astronomy*, *StarWatch*, *Programming*, *Astrophotography*, and *Resources* should prove particularly useful. I also recommend the online astronomy articles found in *Wikipedia* as useful and generally well written.

Thank you!

Gary A. Becker
May 8, 2011

*** 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: archaeoastronomy (astronomy of the ancients), instrumentation, eclipses of the sun and moon, 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 demonstrations and assignments.

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' quarter 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 three examinations. The last 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 down.
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 in class work and homework assignments. **Accuracy and clarity, as well as neatness**, will be used as criteria for grading purposes. When graphs are submitted for examination, the following weights will be assigned: accuracy (3/5th of grade), labeling (1/5th of grade), and neatness (1/5th 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 will not be granted that privilege. 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* can serve this purpose.
 - 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 of one topic separate from other topics and in order.
 - 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** will be allowed only if a student's grade is a "C" or better. Permission from your instructor is required. 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 quarter grades. Participation could add as many as five percentage points to a final grade.

About Your Instructor:

Name: Gary A. Becker

Office phone: Home: 610-282-3583 / Moravian Office: 610-891-1476

E-mail: garyabecker@gmail.com or garyabecker@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, International Planetarium Society, Lehigh Valley Amateur Astronomical Society, Inc.

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!

Your *Astronomy Survival Notebook* and **Astronomy Took Kit** should be brought to each class.

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 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'll make me the best 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 garyabecker@gmail.com or garyabecker@moravian.edu.

EXTRA CREDIT ASSIGNMENTS MORAVIAN COLLEGE ASTRONOMY—ESAC 130

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.

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)

MORAVIAN STUDENTS: PLANETARIUM/OBSERVING FIELD TRIP DATES		
Bus will meet students near flagpole on Turner Street.		
1. Date _____	Depart _____	Return _____
2. Date _____	Depart _____	Return _____
3. Date _____	Depart _____	Return _____
4. Date _____	Depart _____	Return _____
5. Date _____	Depart _____	Return _____

MORAVIAN COLLEGE
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

Hobbies or special interests? _____

Present or proposed career? _____

Reasons for taking this course? _____

—

Anything special that you would like to learn in astronomy? _____

—

—

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

—

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Check the following math courses that you have 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: _____