Elizabethtown Area School District

DISCOVERING THE UNIVERSE

Course Number: 358	Length of Course: 18 weeks
Grade Level:10- 12 Elective	Total Clock Hours: 120
Length of Period: 80 minutes	Date Written: June 11, 2007
Periods per Week/Cycle: 5	Written By: Margie Reed
Credits (if app.): 1	Weighting: 1.0
Prerequisite: None	

Course Description:

This course will include introductory units of Discovery and Inquiry of Astronomy such as – The Origin of the Universe, The Life and Death of Stars, The Galaxies (with focus on the Milky Way Galaxy), The Planets, The Earth/Moon System, Light, and The Cycles and Patterns of Observable Space (The Constellations). The course will require students to complete some night-time observations on their own and will not require a telescope for completion. Students may voluntarily participate in night-time telescopic viewing, led by the teacher. Some algebraic math calculations will be required.

Elizabethtown Area School District

I. Overall Course/Grade Level Standards

Students will KNOW and be able TO DO the following as a result of taking this course.

A. Describe the various theories of universe formation.

B. Explain details about the science behind both Copericán and Newtonian theories of solar system formation.

C. Use astronomy equipment accurately and effectively (ex: telescope, stellar scope, sunspotters, star charts).

D. Understand light and function as both a wave and a particle.

E. Apply Newtonian laws of motion through experimentation.

F. Explain “red-shift” and “blue-shift” as it applies to objects in space as viewed from Earth or near-Earth.

G. Demonstrate proper development of a scientific experiment or demonstration.

H. Describe the composition of the planets, their moons and their atmospheres.

I. Explain birth, life structure and various deaths of stars using the Hertzsprung-Russell diagram.

J. Describe vagabonds of the Milky Way galaxy and our solar system.

K. Explain cycles and patterns of planetary motion and constellations.

L. Explain the Earth/moon system patterns.

M. Describe how the Earth/moon system affects life patterns on Earth.

N. Identify different galaxy types.

O. Explain the requirements for life to exist in an identified solar system.

P. Explain different theories of the universe evolution.

Q. Understand the unique research methods of Astronomy.

R. Refine student questioning techniques of science materials.

Elizabethtown Area School District

II. Content

Major Areas of Study

List all units of study below:

Unit	Estimated Time	Materials
1. The Origin of the Universe	1 week	IMC, TV , VCR, magazine articles, assorted videos
2. Light and Telescopes	2 weeks	Night navigators, solar system models, telescopes, star charts
3. The Earth/Moon System	3 weeks	Planetarium, astrolabes, celestial globes
4. The Other Planets	3 weeks	Star maps for beginners, field guides
5. The Life and Death of Stars	3 weeks	Sun spotters, stellarscopes, Spectrometers, spectra-scopes,
6. The Galaxies and Solar Systems	2 weeks	planetarium
7. The Cycles and Patterns of Observable Space	3 weeks	IMC, field guides, star guides, TV, VCR, various videos
8. Vagabonds of the Solar System	1 week	IMC, Field guides

Elizabethtown Area School District

Name of Course: Discovering the Universe Name of Unit: Light and Telescopes
Essential Question for the Unit: How does an understanding of electromagnetic radiation expand our knowledge of the universe?

Unit Objectives/Key Questions			
A. What is light?	E	C, D, G, R	3.1.12B, 3.2.12A, 3.2.12A, 3.4.10C, 3.4.12C. 3.7.10A,B
B. How do telescopes gather and focus light energy?	I	C, D, G, R	3.1.12B, 3.4.10C, 3.4.12C,D, 3.7.10A,B
C. What are the origins of electromagnetic radiation?	E	D, E, R	3.1.12C, 3.4.12A,B,C 3.4.10C
D. What are red-shift and blue-shift?	E	D, E	3.4.12A,B,C 3.4.10D
E. What are the other methods of observing astronomical objects?	C	D, G	3.4.12C,D 3.4.10D, 3.7.10A,B
F.			
G.			
H.			
I.			
J.			

Elizabethtown Area School District

Name of Course: Discovering the Universe Name of Unit: The Cycles and Patterns of Observable Space

Essential Question for the Unit: How can we use space cycles and patterns to determine location and season on Earth?

Unit Objectives/Key Questions			
A. What scientific processes do astronomers use to study the universe?	E	C, G, I, L, K, Q, R, B	3.1.12C, 3.8.12C, 3.2.12C, 3.7.10A,B,C,D
B. What use are maps of the night sky?	C	K, E	3.4.12A, 3.7.10A
C. What does retrograde motion tell us about planetary motion in our solar system?	E	K	3.1.12E, 3.4.10A
D. How can we use constellations to determine location and season on Earth?	I	K, R	3.1.12E
E. What causes lunar phases?	C	K, B	3.1.12E
F. What causes the seasons and day/night patterns on Earth?	E	K, F	3.1.12E, 3.4.12C
G. How was the modern calendar developed?	I	K, F, B	3.1.12E
H.			
I.			
J.			

Elizabethtown Area School District

Name of Course: Discovering the Universe Name of Unit: The Earth/Moon System
Essential Question for the Unit: How is the Earth/moon system unique in the known universe?

Unit Objectives/Key Questions	'		
A. Why does the Earth provide such an ideal environment for life?	E	H, K, M, O	3.5.10A
B. How does the moon affect Earth's surface features?	I	H, L, M	3.4.10 C, D 3.5.10A
C. How does the moon effect Earth's inside?	C	H, L, M	3.2.12A
D. How does Earth's magnetic field form and what function does it serve to life on the planet?	E	H, M, O	3.4.12.C
E. What surface features do both Earth and our moon share?	I	L, M, J	3.4.10 C, D 3.5.10A
F. Where did our moon come from?	E	H, J	3.4.12.D
G. Can we live on the moon?	C	G, R, O	3.5.10A
H.			
I.			
J.			

Elizabethtown Area School District

Name of Course: Discovering the Universe Name of Unit: The Other Planets
Essential Question for the Unit: How do the planets affect the function of our solar system?

Unit Objectives/Key Questions			
A. What unique qualities do the other planets have?	E	H, O	3.4.12.A, 3.4.10C
B. Are any of the other planets or their moons able to support life?	I	N, O	3.4.12 A, 3.5.10 A
C. What differences exist between "outer ring" planets and "inner ring" planets?	E	H, F	3.4.12C
D. Does planetary axial tilt affect a planets' ability to support life?	I	H, O, F	3.1.12E 3.4.10D
E. Where did the moons of other planets come from?	E	K, G	3.5.10A
F.			
G.			
H.			
I.			
J.			

Elizabethtown Area School District

Name of Course: Discovering the Universe Name of Unit: The Stars
Essential Question for the Unit: How does star type influence solar system formation and development?

Unit Objectives/Key Questions			
A. Is our sun unique in structure and/or function?	E	B, E, I	3.4.12 A, C
B. How does the sun create light and energy?	E	D, E, I	3.4.12 C, 3.4.10D
C. What is a sunspot?	C	R, I, H	3.4.12 C
D. What effects do sunspots have on Earth and our magnetic field?	I	C, D, I	3.1.12 E
E. How does stellar luminescence relate to the surface temperature of a star?	C	I	3.1.12 B, 3.4.12 B, C, D
F. How is stellar mass calculated?	I	H, I	3.4.12 A, D
G. How can we use the Hertzsprung-Russell diagram to determine star class?	E	I	3.1.12 E, 3.4.12 B, D 3.4.10 D
H. What happens to stars as they go from birth through life and death?	E	I, R, Q	3.1.12E 3.4.12D 3.4.10D
I.			
J.			

Elizabethtown Area School District

Name of Course: Discovering the Universe Name of Unit: Galaxies and Solar Systems
Essential Question for the Unit: How does our galaxy compare to other known galaxy types?

Unit Objectives/Key Questions			
A. What are the properties of our Milky Way galaxy?	E	N, O, R	3.4.10 D
B. Where are we located in our galaxy?	C	N, Q	3.4.10 D
C. Are new stars being formed in all galaxies, including the Milky Way?	I	N, Q	3.4.10 D 3.7.10 C
D. What is a black hole and is there one in the center of the Milky Way?	I	N, P	3.4.10 D 3.7.10 C
E. Are all galaxies the same as ours?	I	N	3.4.10 D
F. What is the "dark matter" theory?	C	N, A	3.4.10 D 3.7.10 C
G. Are galaxies cannibals?	C	N	3.4.10 D
H. Is ours the only solar system in the Milky Way?	I	N, Q, R, O	3.1.12 B
I.			
J.			

Elizabethtown Area School District

Name of Course: Discovering the Universe Name of Unit: The Origin of the Universe
Essential Question for the Unit: How did the universe become what we see today?

Unit Objectives/Key Questions			
A. What theories exist to explain the origin of the universe?	E	A, P	3.4.12 D 3.2.12 A 1.8.11 A, B, C 1.6.11 A 1.4.11 B
B Is it possible that there are different universes?	I	A, P	3.1.12 B 3.1.10 B 3.1.12 E
C. What are the different multi-universe theories?	I	A, G, P, R	3.1.10 B 3.1.12 E
D.			
E.			
F.			
G.			
H.			
I.			
J.			

Elizabethtown Area School District

Name of Course: Discovering the Universe Name of Unit: Vagabonds of the Solar System
Essential Question for the Unit: How do asteroids, meteoroids and comets affect the planets and their moons?

Unit Objectives/Key Questions			
A. What are asteroids, meteoroids and comets composed of?	E	H, J, K	3.1.12 B
B. What effect can these vagabonds have on our lives?	I	Q, R	3.4.10 C, D
C. What effect have the vagabonds had on past life on Earth?	C	J, H	3.4.10 C 3.4.12 C
D. How can the vagabonds affect the future of life on Earth?	I	J, H	3.4.10 C 3.4.12 C
E.			
F.			
G.			
H.			
I.			
J.			

Elizabethtown Area School District

III. Course Assessments

Check types of assessments to be used in the teaching of the course.
(Provide examples of each type.)

__X Objective Tests/Quizzes
____ Constructed Responses
_X__ Essays
__X_ Reports
__X_ Projects
____ Portfolios
__X_ Presentations
__X_ Performance tasks
____ _____

X__ Response Journals
____ Logs
__X_ Computer Simulations
__X_ Research Papers
____ Class Participation
____ Notetaking
____ Daily Assignments
__X_ Writing Samples
____ _____

Provide copies of common assessments that will be utilized for all students taking this course. Overall course/grade level standards will be measured by a common course assessment. Unit objectives will be measured on an ongoing basis as needed by the classroom teacher to assess learning and plan for instruction. List common assessements below and recommended date/time frame for administration (at least quarterly).

Name of Common Assessment	When given?
1. Pre//Post Test – **available upon request**.	Beginning/end of course
2. Constellation Research Project/Presentation	Patterns Units
3. Universe Origin Research	Theories Unit
4.	
5.	
6.	

Elizabethtown Area School District

IV. Expected levels of achievement

Current grading scale:

"A^{+}" 98% - 100%	"C" 77% - 79%
"A" 95% - 97%	"C^{-}" 74% - 76%
"A^{-}" 92% - 94%	"D^{+}" 71% - 73%
"B^{+}" 89% - 91%	"D" 68% - 70%
"B" 86% - 88%	"D^{-}" 65% - 67%
"B^{-}" 83% - 85%	"F" 64% - 0%
"C^{+}" 80% - 82%	

PA Proficiency Levels
Advanced Proficient
Basic Below Basic

Attach rubrics, checklists, or other documentation noting how levels of proficiency will be determined for common assessments. The following scoring documents have been developed for this course:

NAME _____ BLOCK _____

CONSTELLATION RESEARCH

The purpose of this project is for you to get very familiar with at least one constellation. You need to be very careful of your spelling and grammar as you go through the writing component of the project. There is a grading rubric on the back of this form which will help you to get the best grade that you can.

Procedure:

1. Select a constellation to research. We will choose names from a beaker to decide who researches which constellation. I am researching the constellation of _____.
2. Research the following things about your constellation. You will be making a poster at our next class session after the IMC, so be sure that you get all of the information required in the time allotted at the IMC.
    a. Myth behind the constellation
    b. What the constellation looks like
    c. The name, right ascension, declination, and story behind at least five stars within the constellation.
    d. What time of the year that the constellation is visible.
    e. The number of stars that make up the constellation
    f. The Greek nomenclature for the five stars that you choose to represent.
3. See the Grading Rubric, on the back of this sheet, for the value of each required component of this project.

You will be creating a poster depicting all of the required information on this project. Please follow the directions below so you can get the best grade possible.

Once research is complete – you will use poster board, of your choice of color, and do the following:

a. Draw a scale alone one edge and the bottom edge for right ascension and declination. Creating a graph on your poster board.
b. Map the stars in your constellation.
c. Label each of the five stars you chose to map with its Greek Letter. Connect the stars to show the figure that your constellation represents.
d. Write the myth behind your constellation on the poster below your drawing. Is it Greek, Roman, Native American…..

GRADING RUBRIC FOR THE POSTER PROJECT

Use of Color _____/5

Finding more than one story from different cultures _____ +5 (bonus)

Mapping of all stars within constellation _____/10

Myth behind the constellation _____/20

Five stars named, RA, Dec _____/30

Visibility at ? time of the year _____/5

Greek Letter representing the 5 chosen stars within the constellation _____/10

Neatness, time on task, grammar _____/20

TOTAL PROJECT _____/100

UNIVERSAL THEORIES
RESEARCH PROJECT

In this project you (or you and a partner) will choose two "universal theories" to discuss. Because there are really only two schools of thought about how the universe began (creationism and "Big Bang") and we can only discuss Big Bang Theory in class, we will focus all our energy on different ideas within the Big Bang theory.

1. All papers will begin with a description of the Big Bang Theory – What is big bang? What scientific evidence is used to "prove" big bang? Does big bang explain everything about observable space or is it lacking proofs in some way? If you find information about shortcomings in the big bang theory, discuss them.
2. Choose two debatable aspects within big bang:
    a. String Theory
    b. Steady-State Theory
    c. Inflation Theory
    d. Multiple Universes Theory – separate from string and multi-string theory.
3. Research and discuss these two theories thoroughly. Provide a description of each, what it means, what it says, how it can be proven or disproved…. Be thorough!
4. Once you have laid the ground work for each theory – begin to compare them – point out where one may be stronger than the other, areas of difference, areas of similarity.
5. Which one do you find more believable? Choose the one that you find more feasible and defend it.
6. Create a poster or other visual describing the one that you would support.
7. This project will amount to a 5-6 page paper (at least) and a visual of some kind. You will NOT be presenting these to the class – you will however, be turning all of this in to me before the end of the course – so all will be due on the 21st - the last day of classes.
8. This project will be worth 150 points!!

Your grade will come from the following:

1. Time on Task – I will be watching this progress. If I see that one partner is doing more than their fair share – I will be asking you to do the project on your own – so it is worth it to do your share of the work here.
2. Accuracy of Information – I have a decent background on all these topics have been reading some of the newest information on universal theories. I have found them to be really fascinating and I know that if you really read the information and try to think of what the authors are saying – you will find them really interesting as well – If you get lost or confused, I would love to discuss any of these ideas with you as we go through the project.

3. Willingness to discuss confusions and ideas that you come up with as you try to pull together the information you are researching. I would be disappointed if you did not have at least one question or idea that you would like to discuss with me during this project. Much of the material written about these topics is written at a level of understanding that even confuses me sometimes, so I know that you will find aspects of these topics that can be really confusing. Please come talk to me about it.
4. Appearance and completeness. I will be looking at these in a way that a college professor might look at them. With very critical eyes. I will be looking to see whether you learned anything about the universe in this class. This will tell me how I can change the course and make it better for future students. I will specifically look at your research abilities – Are you any better at looking up information and choosing only reputable sites to quote or site? Are you using knowledge acquired in this class to support your points? – I will also be paying close attention to the visual that you create for this project. Have you put any real time into it? How did you use information gathered to create it and does it clearly show what you found out about this theory that convinced you that it was the better one?