

Course Information

Date Submitted: 4/12/2016

Current Prefix and Number: AST - Astronomy , AST 191 THE SOLAR SYSTEM

Other Course:

Proposed Prefix and Number: AST 191

What type of change is being proposed?

Major – Add Distance Learning

Should this course be a UK Core Course? Yes

Inquiry - Nat/Math/Phys Sci

RECEIVED

APR 13 2016

OFFICE OF THE
SENATE COUNCIL**1. General Information**

a. Submitted by the College of: ARTS & SCIENCES

b. Department/Division: Physics And Astronomy

c. Is there a change in 'ownership' of the course? No

If YES, what college/department will offer the course instead: Select...

e. Contact Person

Name: Ronald Wilhelm

Email: ron.wilhelm@uky.edu

Phone: 257-6727

Responsible Faculty ID (if different from Contact)

Name:

Email:

Phone:

f. Requested Effective Date

Semester Following Approval: Yes OR Effective Semester:

2. Designation and Description of Proposed Course

a. Current Distance Learning (DL) Status: Please Add

b. Full Title: THE SOLAR SYSTEM

Proposed Title: THE SOLAR SYSTEM

c. Current Transcript Title: THE SOLAR SYSTEM

Proposed Transcript Title:

d. Current Cross-listing: none

Proposed – ADD Cross-listing :

Proposed – REMOVE Cross-listing:

e. Current Meeting Patterns

LECTURE: 3

Proposed Meeting Patterns

LECTURE: 3

f. Current Grading System: ABC Letter Grade Scale

Proposed Grading System: *Letter (A, B, C, etc.)*

g. Current number of credit hours: 3

Proposed number of credit hours: 3

h. Currently, is this course repeatable for additional credit? No

Proposed to be repeatable for additional credit? No

If Yes: Maximum number of credit hours:

If Yes: Will this course allow multiple registrations during the same semester? No

2i. Current Course Description for Bulletin: A course emphasizing the nature, origin and evolution of planets, satellites and other objects in the Solar System. Topics also include historical astronomy, the naked eye phenomena of the sky and modern solar system discoveries made by spacecraft. This course may be taken independently of AST 192.

Proposed Course Description for Bulletin: A course emphasizing the nature, origin and evolution of planets, satellites and other objects in the Solar System. Topics also include historical astronomy, the naked eye phenomena of the sky and modern solar system discoveries made by spacecraft. This course may be taken independently of AST 192.

2j. Current Prerequisites, if any:

Proposed Prerequisites, if any:

2k. Current Supplementary Teaching Component:

Proposed Supplementary Teaching Component: No Change

3. Currently, is this course taught off campus? No

Proposed to be taught off campus? No

If YES, enter the off campus address:

4. Are significant changes in content/student learning outcomes of the course being proposed? No

If YES, explain and offer brief rationale:

5a. Are there other depts. and/or pgms that could be affected by the proposed change? No

If YES, identify the depts. and/or pgms:

5b. Will modifying this course result in a new requirement of ANY program? No

If YES, list the program(s) here:

6. Check box if changed to 400G or 500: No

Distance Learning Form

Instructor Name: Ronald Wilhelm

Instructor Email: ron.wilhelm@uky.edu

Internet/Web-based: Yes

Interactive Video: No

Hybrid: No

1. How does this course provide for timely and appropriate interaction between students and faculty and among students?

Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations? The lecture component of the course will be delivered a-synchronously through video segments interspersed with conceptual questions for the students to answer and receive feed back. The activity portion and final research paper will also have aspects that contain video segments but we will also be using Adobe Connect to conduct bi-weekly, synchronous discussion sessions with the students. These will be run by both the faculty member and the teaching assistants. Adobe Connect has the ability to record sessions, and these recorded sessions will also be available for students to re-watch a-synchronously. During the final research projects there will also be discussion board contributions that students will be required to make which will assist in student-to-student interactions. Finally, the faculty member and the TAs will be available for individual questions via email, or phone.

2. How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course goals, assessment of student learning outcomes, etc. The course is identical to the non-DL AST 191 course. The lectures, reading materials, assessments and learning outcomes are all identical. The only variations are the weekly in-class activities and the final research projects. In the non-DL course the in-class activity is conducted in the classroom each week. As I have described in C.I. #1, in the DL class we will discuss activities synchronously using Adobe Connect. In the non-DL class we spend one class room period a week to discuss Introduction, Experimental Design, Data analysis and Results, and Conclusion. This we will also do synchronously with the DL class. Other than this, the DL course is identical to the non-DL course, in terms of student write ups, drafts, final paper. The DL students will be using the exact same rubric as the non-DL classes and the requirements are all identical.

3. How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc. A large portion of the students' grade comes from written summaries of activities, drafts of final research projects and final paper (45% of grade). These submissions will be checked using plagiarism software to insure students have done their own work. (this is also what we do in the non-DL course). Exams will be taken on line (30% of grade). The format for the exams are multiple-choice essay which means essay style questions are asked with essay style answers to choose from. The questions and the answers will be randomized and the exams will be timed, and only allowed to be take in one session. This makes is difficult for people to interact or look up answers online, because there are no quick easy answers to look up. The academic offense policy is the same as the non-DL course and spelled out in the syllabus.

4. Will offering this course via DL result in at least 25% or at least 50% (based on total credit hours required for completion) of a degree program being offered via any form of DL, as defined above? No

If yes, which percentage, and which program(s)? This will not effect any degree programs.

5. How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting? In the course syllabus it is outlined how to find help using the Career Center, Library and Learning Resources, and technical help with links and phone numbers to call.

6. How do course requirements ensure that students make appropriate use of learning resources? In the AST 191 (non-DL) course we provide links to on-line websites that help to explain topics covered in lecture. Students need to read this material to get a greater depth of knowledge on topics for activities and for exams. In the final projects is it necessary for students to understand background informations on their projects, which they find from web-based sources. They also compare their final results to that of published results and this also requires web-based learning resources. The AST 191 (DL) course will follow exactly what is done in the non-DL course.

7. Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program. In the AST 191 (non-DL) we do not use a laboratory or other types of equipment. We access information on-line, from data archives. The in-class activities are self-contained with novel concept questions that relate to the lecture topics. This AST 191 (DL) course will follow exactly what is done in the non-DL course.

8. How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and/or receipt of the course, such as the Information Technology Customer Service Center (<http://www.uky.edu/UKIT/>)? Yes, this is all in the syllabus.

9. Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)? YES

If no, explain how student enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology.

10. Does the syllabus contain all the required components? YES

11. I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name: Ronald J. Wilhelm

SIGNATURE|SRDAS2|Sumit R Das|AST 191 CHANGE Dept Review|20151016

SIGNATURE|ACSI222|Anna C Harmon|AST 191 CHANGE College Review|20160202

SIGNATURE|JMETT2|Joanie Ett-Mims|AST 191 CHANGE UKCEC Review|20160413

SIGNATURE|JMETT2|Joanie Ett-Mims|AST 191 CHANGE Undergrad Council Review|20160413

SIGNATURE|RJADAMS|Robert J Adams|AST 191 CHANGE UKCEC Expert Review|20160413

Course Change Form

https://myuk.uky.edu/sap/bc/soap/rfg?services=

Open in full window to print or save

Generate R

Attachments:

Browse...

Upload File

ID	Attachment
Delete 6671	syllabus_191_online_sum16c.pdf
Delete 6680	UKCEC memo to SC - AST 191DL.pdf

First 1 Last

NOTE: Start form entry by choosing the Current Prefix and Number (*denotes required fields)

Current Prefix and Number:		AST - Astronomy AST 191 THE SOLAR SYSTEM	Proposed Prefix & Number: (example: PHY 401G) <input checked="" type="checkbox"/> Check if same as current	AST 191
* What type of change is being proposed?		<input type="checkbox"/> Major Change <input checked="" type="checkbox"/> Major - Add Distance Learning <input type="checkbox"/> Minor - change in number within the same hundred series, exception 600-7: the same "hundred series" <input type="checkbox"/> Minor - editorial change in course title or description which does not imply a change in content or emphasis <input type="checkbox"/> Minor - a change in prerequisite(s) which does not imply a change in course content or emphasis, or which is made necessary by the elimination or significant alteration of the prerequisite(s) <input type="checkbox"/> Minor - a cross listing of a course as described above		
Should this course be a UK Core Course? <input checked="" type="radio"/> Yes <input type="radio"/> No				
If YES, check the areas that apply:				
<input type="checkbox"/> Inquiry - Arts & Creativity <input type="checkbox"/> Composition & Communications - II <input type="checkbox"/> Inquiry - Humanities <input type="checkbox"/> Quantitative Foundations <input checked="" type="checkbox"/> Inquiry - Nat/Math/Phys Sci <input type="checkbox"/> Statistical Inferential Reasoning <input type="checkbox"/> Inquiry - Social Sciences <input type="checkbox"/> U.S. Citizenship, Community, Diversity <input type="checkbox"/> Composition & Communications - I <input type="checkbox"/> Global Dynamics				
1. General Information				
a. Submitted by the College of:		ARTS & SCIENCES		Submission Date: 4/12/2016
b. Department/Division:		Physics And Astronomy		
c.* Is there a change in "ownership" of the course?				
<input type="radio"/> Yes <input checked="" type="radio"/> No If YES, what college/department will offer the course instead? <input type="text" value="Select..."/>				
e.* * Contact Person Name: Ronald Wilhelm Email: ron.wilhelm@uky.edu Phone: 257-6727				
* Responsible Faculty ID (if different from Contact): Email: Phone:				
f.* Requested Effective Date:		<input checked="" type="checkbox"/> Semester Following Approval		OR <input type="checkbox"/> Specific Term: 2
2. Designation and Description of Proposed Course.				
a. Current Distance Learning(DL) Status:		<input type="radio"/> N/A <input type="radio"/> Already approved for DL* <input checked="" type="radio"/> Please Add <input type="radio"/> Please Drop		
*If already approved for DL, the Distance Learning Form must also be submitted <u>unless</u> the department affirms (by checking this box) that the proposed changes do not affect DL delivery.				
b. Full Title:		THE SOLAR SYSTEM		Proposed Title: * THE SOLAR SYSTEM
c. Current Transcript Title (if full title is more than 40 characters):		THE SOLAR SYSTEM		
c. Proposed Transcript Title (if full title is more than 40 characters):				
d. Current Cross-listing:		<input type="checkbox"/> N/A		OR Currently ³ Cross-listed with (Prefix & Number): none

Proposed - ADD ² Cross-listing (Prefix & Number):					
Proposed - REMOVE ^{3,4} Cross-listing (Prefix & Number):					
e. Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours⁵ for each meeting pattern type.					
Current:	Lecture 3	Laboratory ²	Recitation	Discussion	indep. Study
	Clinical	Colloquium	Practicum	Research	Residency
	Seminar	Studio	Other: Please explain:		
Proposed: *	Lecture 3	Laboratory ²	Recitation	Discussion	indep. Study
	Clinical	Colloquium	Practicum	Research	Residency
	Seminar	Studio	Other: Please explain:		
f. Current Grading System:		ABC Letter Grade Scale			
Proposed Grading System:*		<input checked="" type="radio"/> Letter (A, B, C, etc.) <input type="radio"/> Pass/Fail <input type="radio"/> Medicine Numeric Grade (Non-medical students will receive a letter grade) <input type="radio"/> Graduate School Grade Scale			
g. Current number of credit hours:	3	Proposed number of credit hours:*	3		
h.* Currently, is this course repeatable for additional credit?					<input type="radio"/> Yes <input checked="" type="radio"/> No
* Proposed to be repeatable for additional credit?					<input type="radio"/> Yes <input checked="" type="radio"/> No
If YES:	Maximum number of credit hours:				
If YES:	Will this course allow multiple registrations during the same semester?				<input type="radio"/> Yes <input checked="" type="radio"/> No
i. Current Course Description for Bulletin:					
A course emphasizing the nature, origin and evolution of planets, satellites and other objects in the Solar System. Topics also include historical astronomy, the naked eye phenomena of the sky and modern solar system discoveries made by spacecraft. This course may be taken independently of AST 192.					
* Proposed Course Description for Bulletin:					
A course emphasizing the nature, origin and evolution of planets, satellites and other objects in the Solar System. Topics also include historical astronomy, the naked eye phenomena of the sky and modern solar system discoveries made by spacecraft. This course may be taken independently of AST 192.					
j. Current Prerequisites, if any:					
* Proposed Prerequisites, if any:					
k. Current Supplementary Teaching Component, if any:				<input type="radio"/> Community-Based Experience <input type="radio"/> Service Learning <input type="radio"/> Both	

Proposed Supplementary Teaching Component:	<input type="radio"/> Community-Based Experience <input type="radio"/> Service Learning <input type="radio"/> Both <input checked="" type="radio"/> No Change
3. Currently, is this course taught off campus?	<input type="radio"/> Yes <input checked="" type="radio"/> No
* Proposed to be taught off campus?	<input type="radio"/> Yes <input checked="" type="radio"/> No
If YES, enter the off campus address:	
4.* Are significant changes in content/student learning outcomes of the course being proposed?	<input type="radio"/> Yes <input checked="" type="radio"/> No
If YES, explain and offer brief rationale:	
5. Course Relationship to Program(s).	
a.* Are there other depts and/or pgms that could be affected by the proposed change?	<input type="radio"/> Yes <input checked="" type="radio"/> No
If YES, identify the depts. and/or pgms:	
b.* Will modifying this course result in a new requirement ² for ANY program?	<input type="radio"/> Yes <input checked="" type="radio"/> No
If YES ² , list the program(s) here:	
6. Information to be Placed on Syllabus.	
a. <input type="checkbox"/> Check box if changed to 400G or 500.	If changed to 400G- or 500-level course you must send in a syllabus and you must include the differentiation between undergraduate and graduate students by: (i) requiring additional assignments by the graduate student and/or (ii) establishing different grading criteria in the course for graduate students. (See SR 3.1.4.)

Distance Learning Form

This form must accompany every submission of a new/change course form that requests distance learning delivery. This form may be required when changing a course already approved for delivery. All fields are required!

Introduction/Definition: For the purposes of the Commission on Colleges Southern Association of Colleges and Schools accreditation review, *distance learning* is defined as formal educational process in which the majority of the instruction (interaction between students and instructors and among students) in a course occurs when students and instructors are not in the same place. Instruction may be synchronous or asynchronous. A distance learning (DL) course may employ correspondence study, or audio, video, computer technologies.

A number of specific requirements are listed for DL courses. The **department proposing the change in delivery method is responsible for ensuring that the requirements below are satisfied at the individual course level.** It is the responsibility of the instructor to have read and understood the university-level assurances regarding an equitable experience for students utilizing DL (available at <http://www.uky.edu/USC/New/forms.htm>).

Course Number and Prefix: AST 191	Date: 9/10/2015
Instructor Name: Ronald Wilhelm	Instructor Email: ron.wilhelm@uky.edu
Check the method below that best reflects how the majority of the course content will be delivered.	
Internet/Web-based <input checked="" type="checkbox"/>	Interactive Video <input type="checkbox"/>
Hybrid <input type="checkbox"/>	

Curriculum and Instruction

1. How does this course provide for timely and appropriate interaction between students and faculty and among students? Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations?

The lecture component of the course will be delivered a-synchronously through video segments interspersed with conceptual questions for the students to answer and receive feedback. The activity portion and final

2. How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course go; assessment of student learning outcomes, etc.

The course is identical to the non-DL AST 191 course. The lectures, reading materials, assessments and learning outcomes are all identical. The only variations are the weekly in-class activities and the final

3. How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc.

A large portion of the students' grade comes from written summaries of activities, drafts of final research projects and final paper (45% of grade). These submissions will be checked using plagiarism software to

4. Will offering this course via DL result in at least 25% or at least 50%* (based on total credit hours required for completion) of a degree program being offered via a form of DL, as defined above?

No

Which percentage, and which program(s)?

This will not effect any degree programs.

*As a general rule, if approval of a course for DL delivery results in 50% or more of a program being delivered through DL, the effective date of the course's DL delivery will be six months from the date of approval.

5. How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting?

In the course syllabus it is outlined how to find help using the Career Center, Library and Learning Resources, and technical help with links and phone numbers to call.

Library and Learning Resources

6. How do course requirements ensure that students make appropriate use of learning resources?

In the AST 191 (non-DL) course we provide links to on-line websites that help to explain topics covered in lecture. Students need to read this material to get a greater depth of knowledge on topics for activities

7. Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program.

In the AST 191 (non-DL) we do not use a laboratory or other types of equipment. We access information on-line, from data archives. The in-class activities are self-contained with novel concept questions that

Student Services

8. How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and receipt of the course, such as the Information Technology Customer Service Center (<http://www.uky.edu/UKIT/>)?

Yes, this is all in the syllabus.

9. Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)?

Yes

No

If no, explain how students enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology.

10. Does the syllabus contain all the required components, below? Yes

- Instructor's *virtual* office hours, if any.
- The technological requirements for the course.
- Contact information for Distance Learning programs (<http://www.uky.edu/DistanceLearning>) and Information Technology Customer Service Center (<http://www.uky.edu/UKIT/Help/>; 859-218-HELP).
- Procedure for resolving technical complaints.
- Preferred method for reaching instructor, e.g. email, phone, text message.
- Maximum timeframe for responding to student communications.
- Language pertaining academic accommodations:
 - "If you have a documented disability that requires academic accommodations in this course, please make your request to the University Disability Resource Center. The Center will require current disability documentation. When accommodations are approved, the Center will provide me with a Letter of Accommodation which details the recommended accommodations. Contact the Disability Resource Center, Jake Karnes, Director at 859-257-2754 or jkarnes@email.uky.edu."
- Specific dates of face-to-face or synchronous class meetings, if any.
- Information on Distance Learning Library Services (<http://www.uky.edu/Libraries/DLIS>)
 - Carla Cantagallo, DL Librarian
 - Local phone number: 859 257-0500, ext. 2171; long-distance phone number: (800) 828-0439 (option #6)
 - Email: dllservice@email.uky.edu
 - DL Interlibrary Loan Service: http://www.uky.edu/Libraries/llpage.php?web_id=253&lib_id=16

11. I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name:

Ronald J. Wilhelm

Abbreviations: DLP = Distance Learning Programs ATG = Academic Technology Group Customer Service Center = 859-218-HELP (<http://www.uky.edu/UKIT/help>)

Revised 8/09

¹¹¹ See comment description regarding minor course change. *Minor changes are sent directly from dean's office to Senate Council Chair.* If Chair deems the change as "n form will be sent to appropriate academic Council for normal processing and contact person is informed.

¹¹² Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.

¹¹³ Signature of the chair of the cross-listing department is required on the Signature Routing Log.

¹¹⁴ Removing a cross-listing does not drop the other course – it merely unlinks the two courses.

¹¹⁵ Generally, undergrad courses are developed such that one semester hr of credit represents 1 hr of classroom meeting per wk for a semester, exclusive of any lab meeting generally represents at least two hrs per wk for a semester for 1 credit hour. (See *SR 5.2.1.*)

¹¹⁶ You must *also* submit the Distance Learning Form in order for the course to be considered for DL delivery.

¹¹⁷ In order to change a program, a program change form must also be submitted.



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April 13, 2016

Memorandum

To: Senate Council

From: Joanie Ett-Mims, UK Core Education Committee coordinator

Re: AST course change UKCEC approval

The UKCEC received a course change request for AST 191 on February 2, 2016. The request was to approve the course as a distance learning course. Since the course has already been approved for UK Core and no changes to the course content were requested, the UKCEC did not require the department to attach the course review form in eCATS. The UKCEC voted to approve the course and sent it forward to the Undergraduate Council on April 11, 2016.

The Undergraduate Council voted to approve the course change and sent it forward to Senate Council on April 13, 2016.

Thank you for your consideration.

Solar System Astronomy
AST 191_001 – UK Core Course
Summer 2016

Instructor: Ron Wilhelm

Office: Chem-Phys Building Room 275

Contact information: ron.wilhelm@uky.edu
(806) 543-9245 (cell phone)

Office Hours: Throughout the term we will be conducting several weekly meetings with students using Adobe Contact. You will have the opportunity to ask questions during these sessions. Also, the TAs and I, will be checking our email periodically during the week, Monday through Friday and occasionally on the weekend. I will reply to your emails within a 24 hour period. If you need a quicker response or you would prefer to discuss a question verbally you call my cell phone at anytime.

TAs: TBA

Textbook: There is NOT an assigned textbook for this course. Instead there will be internet readings and applications that will be assigned through links on Canvas. This can be found in the “Reading & Apps” folder.

On-line support

To test your Internet connection to see if it is sufficient, run the following speed test (*Note: testing from campus is unnecessary and will result in abnormally high results*): If you have any questions or need assistance, the UKIT Service Desk is available for all supported student technology needs. Information for how to contact the Service Desk can be found [here](#). If you have questions or problems accessing Canvas you should contact one of the following:

Academic Technology Group
<http://www.uky.edu/ukit/atg>
859-218-HELP (859-218-4357)
218help@uky.edu

Support for Canvas is available 24/7 at the [APAT Service Desk](#) at 859-218-HELP (4357).

Additional information is available with the Tech Tips for UK Students available at <http://www.uky.edu/ukit/techtips/students>

Library and Learning Resources

You may seek help and gain access to the resources available through Distance Learning Library Services.

Student Services

Students have adequate access to the range of services appropriate to support the programs, including admissions, financial aid, academic advising and delivery of course materials, and placement and counseling. Students are encouraged to utilize the resources of the Career Center as well as to contact directors of undergraduate and graduate studies in the student's field of interest for additional career and academic information.

Course Description for AST 191:

Solar System Astronomy is a course emphasizing the nature, origin and evolution of planets, satellites and other objects in the Solar System. Topics also include historical astronomy, the naked eye phenomena of the sky and modern solar system discoveries made by spacecraft. This course may be taken independently of AST 192.

The Course Overview:

This astronomy course is likely to be quite different than what you are expecting. In most introductory science courses a professor will spend a great deal of time telling you what scientists do, and what scientists have found. In this class we will spend a great deal of time actually DOING science.

We will begin the term investigating some physics concepts, and then properties of Earth, the solar system and the individual planets. Throughout the term you will be given assignments that will require you to make conjectures, analyze data, make plots, determine results and draw conclusions from these results. These bench mark activities are designed to help you understand how to approach an astronomical problem using sound scientific techniques.

In the final three weeks of the term you will be asked to work on a research project which involves real data analysis. We will make use of the large amount of data available on-line from missions to the planets, moons, asteroids and comets. The project will require you to make a sound conjecture about some physical process and explore that conjecture using measurements of data in order to determine a result. This project will also include literature research on the topic and comparisons between your conclusions and published results. In short, you will be asked to become a scientist for your project.

Expected Learning Outcome (What you should know by the end of the course)

1. Describe methods of inquiry that lead to scientific knowledge and distinguish scientific fact from pseudoscience.

Throughout this course students will be asked to develop conjectures about the reason for a given physical phenomenon. They will then be given various observables (lines of evidence) and asked to reconcile these observables with their conjecture. If their conjecture is falsified by the observables, then they will be asked to modify their conjecture to allow it to meet the observable criteria. As an example, early in the course

students will be asked to conjecture why there are seasons on the Earth. They will then be given various observables, such as the seasons are flipped between the North and South Hemispheres. They will then have to modify their original conjecture to be consistent with this observable. This type of inquiry will be used throughout the course and in the student's final projects.

2. Explain fundamental principles in a branch of science.

In this course we will make use of many scientific principles in order to describe various phenomena. We will make use of Newton's Laws of Motion, Newton's Law of Gravity, Energy Conservation, Geologic principles of superposition, stratigraphy, volcanism, Coriolis Effect, etc. These fundamental principles will be used to describe phenomena on various planets, satellites and minor planets. Students will not only use these principles but will also be required to demonstrate their understanding of the fundamental principle that they are using.

3. Apply fundamental principles to interpret and make predictions in a branch of science.

In this course we will use most of the fundamental principles to describe phenomena seen on the Earth. We will then use these same principles to both predict and describe what is happening on other objects in the Solar System. We will assume that the fundamental principles work throughout the Universe and that variations between the principle and the observable are due to either incorrect conjecture on the nature of the phenomenon or the requirement that more than one principle is need to describe the phenomenon. This application of fundamental principles will be applied throughout the term and will be a required component of the final student projects.

4. Demonstrate an understanding of at least one scientific discovery that changed the way scientists understand the world.

This course will require students to demonstrate an understanding of many different important scientific discoveries. A primary example is the difference between the Geocentric (Earth-Centered) universe and a Heliocentric (Sun-Centered) universe. Students will demonstrate how the Geocentric Model explains retrograde motion of planets in terms of complex epicycles and contrast this to the Heliocentric Model which very simply explains this motion by assuming the Sun is at the center of the system. Another example is the various formation mechanisms for the Earth's moon. Students demonstrate understanding of why certain models are no longer as probable given the our current data. The student understanding is in part demonstrated by having students use data on other satellite systems that appear to have formed from a different mechanism than our moon. This type of comparison also reinforces the data driven nature of science, where hypotheses that do not fit the observations fall out of favor.

5. Give examples of how science interacts with society.

This course will provide knowledge of the workings of the Earth and the Earth's history. Furthermore the analysis of other objects in the Solar System allows us to construct some of the history of our planet. The potentially catastrophic result of asteroid collisions warns of potential dangers to our society and directly interacts with society through federal funding of near-asteroid search programs. The greenhouse effect on

Venus warns of the results of a runaway greenhouse effect and serves to inform society of the potential impacts of global warming.

6. Conduct a hands-on project using scientific methods to include design, data collection, analysis, summary of the results, conclusions, alternative approaches, and future studies.

In this course, students will be expected to learn a scientific approach to understanding our Solar System. Throughout the course students will be taught to construct sound conjectures, test their conjectures using known observables and fundamental principles of science, and modify their conjectures to become consistent with what is known. This is accomplished through weekly hands-on activities with individual student reports being submitted. The course will also include a final research project where students will conduct research on a topic and use data and principles to reach a scientific conclusion about the topic. Students will be required to write a final paper that includes literature research, student measurements and analysis, results, and conclusions that include a the importance to the global understanding of the object, an indication of uncertainty in the results, and potential improvements to the study.

One example of a student project is using crater density on the surface of Mars to determine the age of geologic features, such as dried river beds. In this example, students use NASA images to measure the crater density of various interesting features on the planet. This measure is then compared to the known age-crater density relation provided by Lunar investigations. The results from this investigation will provide constraints on when liquid water flowed on Mars and provide a time-scale for when Mars began to lose its atmosphere.

7. Recognize when information is needed and demonstrate the ability to find, evaluate and use, effectively, sources of scientific information.

The final project in this course will demonstrate the student's ability to find and evaluate other sources of scientific information. The research projects will not be specifically covered in the lecture portion of the course. Students will need to form a conjecture about what the observations for the project are indicating to them. Although the specific project data will not be available in other published scientific information, students will need to read about similar investigations in order to find the best way to proceed with their investigations, understand the limitations and accuracy of their results, and conjecture about possible differences found between their results and published results.

In the previous example of crater densities on Mars, there are published values for when water last flowed across the surface. Students will need to compare their specific results to these published results and reach a conclusion about why differences in the time-scale for water flow may have occurred.

Methods of Assessing the Expected Learning Outcomes

Exam 1 will test the ability to interpret data, uncertainties, critical analysis of results, understanding of basic physical principles and basic properties of areas covered and developed in class. Exam 2 will cover everything learned in the course, from

astronomical facts and theories, to the demonstration of critical thinking in novel situations and the ability to back up this reasoning with sound scientific arguments. Graded submissions to Canvas of class activities will be used to assess gains in understanding over the extent of the course and to assess understanding of individual topics covered in our daily discussions. Draft reports for student research projects, submitted to Canvas, will be used to assess the development and evolution of each research topic and assess the critical analysis and formation of concept bridges. Final research defense, in the form of a written paper, will assess the ability to interpret data, draw meaningful conclusion, and present results in a coherent and concise manner.

Grading

Class activities

During the first five weeks of this course we will have eight bench-mark activities which are designed to increase student conceptual understanding and convey research skills needed to conduct your final research project. These activities will be presented online via video clips and probing questions. After or while students are working on these activities, there will be “real-time” Adobe Connect sessions run by the instructor or TAs. These discussion sessions will allow groups of students to discuss possible answers and receive guidance on how to complete the activity. All Adobe Connect Sessions will be recorded and placed in the “Meeting” folder on Canvas, which will allow students to also re-watch the discussion.

You will be asked to submit a written paper that covers all the questions posed in the given activity. A grading rubric for each activity will be supplied to guide your discussion in your paper. Your written paper will be submitted to Canvas where it will be graded. For full credit you must attend the Adobe Connect discussion session submit a written paper. Grades for activities will be split with 50% given for attendance in the Adobe Connect discussion session and 50% for the written paper submission.

Lecture Participation

The lecture portion of this class be delivered through video segments that you watch on Canvas. Interspersed between video segments will be questions that are posed about the material being discussed. You will be asked to answer these questions as they come along, between the video clips. The answers will not be graded as right/wrong but only as participation. There will be immediate feedback give for question so that you will know the reasoning behind the correct answer. This participation will be worth 10% of your final grade in the course.

Quizzes

There will be short quizzes given after each topic is completed in the lecture portion. These quizzes will be short, multiple-choice, that will assess your understanding of the topical material covered. Each quiz will be worth 5 course points. There will be a total of 28 short quizzes. **Twenty will count toward your final grade.**

Exams

We will have two exams during the term. These exams will cover aspects of factual material about the solar system, test understanding of fundamental physical concepts and present critical thinking problems which will draw on the scientific skills developed over the extent of the course. Both exams will be taken online must be completed at some time during the 2-day window that the Exam is open. You will have 1-hour to complete the exam and once you begin the exam you must complete it in the 1-hour time period. You **CANNOT** quit the exam and continue it at a later date.

Final Project (Benchmark drafts and final paper)

Instead of a final exam for the course, each student will be required to submit a scholarly paper on their project. The paper will include an introduction with background information on the project and a sound scientific conjecture on what you expected to find and why you are doing this project. It will also include a section on the data collected and analyzed, including all assumptions that went into the processing of the data. There will be a result section that discusses the final results and uncertainty in those results. Finally, a conclusion that ties back into your original conjecture of what you expected to find, discussion of what other research has found, further conjectures on what this information tells you about global aspects of the given object and a discussion of how your project could be improved and/or modified.

In the last 3 weeks of the course you will be asked to provide input on your research topic, discussing what you are currently doing and why. Participation will be graded for the input that you give on your own topic, and also discussions that you have about other groups' research topics. This involvement will be crucial to the success of everyone's research project and is therefore an important part of your project grade.

	Percentage of grade	Class Points
In-class activities:	20.4%	166
Quizzes (best 20 out of 28)	12.3%	100
Lecture Participation	12.0%	98
Exam #1	15.1%	123
Exam #2	15.1%	123
Final Research Project (drafts and paper)	25.1%	205
TOTAL	100%	815

The grade scale for this course will be:

90% - 100%	(734 – 815 points)	A
80% - 89%	(652 - 733 points)	B
70% - 79%	(571 - 651 points)	C
60% - 69%	(489 – 570 points)	D
below 60%	(below 489 points)	E

A Midterm Evaluation will be provided by the midterm date so students can judge their course performance.

If you have a documented disability that requires academic accommodations, please contact me as soon as possible. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Suite 407, MDS Building, 725 Rose Street, 257-2754, email dtbeac1@uky.edu) for coordination of campus disability services available to students with disabilities.”

Course Policies

Attendance -- Since this is an on-line course attendance for lecture component can occur at the convenience of the student. However, it will be necessary to keep pace with the course in order to do well on exams and to fully understand the material in the activities.

Attendance is required in the Adobe Connect sessions. Each student must attend at least one session for each activity and one session for each portion of the final research project. The final research project will have five components, picking a topic, introduction/background material, experimental design, data analysis/results, and conclusion.

Excused Absences

Students need to notify the professor of absences prior to class when possible. *Senate Rules 5.2.4.2* defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit “reasonable cause for nonattendance” by the professor.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Two weeks prior to the absence is reasonable, but should not be given any later. Information regarding major religious holidays may be obtained through the Ombud (859-257-3737, http://www.uky.edu/Ombud/ForStudents_ExcusedAbsences.php).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused) per University policy.

Per *Senate Rule 5.2.4.2*, students missing any graded work due to an excused absence are responsible: for informing the Instructor of Record about their excused absence within one week following the period of the excused absence (except where prior notification is required); and for making up the missed work. The professor must give the student an opportunity to make up the work and/or the exams missed due to an excused absence, and shall do so, if feasible, during the semester in which the absence occurred.

Verification of Absences / Make-up Opportunities

Students may be asked to verify their absences in order for them to be considered excused. *Senate Rule 5.2.4.2* states that faculty have the right to request “appropriate verification” when students claim an excused absence because of illness, or death in the family. Appropriate notification of absences due to University-related trips is required prior to the absence when feasible and in no case more than one week after the absence.

For an excused absence, students will be given the opportunity to make up the missed material. The instructor or TA must be notified within one week of the excused absence and a makeup will be arranged. No makeup will be given if the student does not contact the instructor or TA within the one week period.

Submission of assignments -- Activity submissions, project discussions, project draft submissions and final project papers will be submitted on the Canvas. All student contributions must be submitted before the due date. Any submission after the assignment is closed will not receive a grade for the contribution.

MISSED EXAMINATIONS

Make-up exams (for missed examinations) will only be given for DOCUMENTED excused absences as defined by the University (Senate Rule V.2.4.2) and are scheduled as needed. A missed exam will result in a score of zero for that exam, unless an acceptable written excuse is presented within one week of the missed examination.

Check the Information on Examinations in the ASSIGNMENTS AND EXAMS section of Canvas to confirm the topics/chapters covered on each examination.

ONLINE EXAMINATION INFORMATION

The online examinations will be submitted electronically through Canvas and must be submitted by the stated deadline (11:59PM ET). Each examination will consist of 10 multiple-choice questions. It is your responsibility to make sure that you access the material during that time period. You can access the examination any time during the 42 hour window but you can only access it once. Once you access an examination you have 1 hour (Final – 2 hours, see above) in which to complete and submit it. If you go over the time you will not be able to submit it and will receive an automatic score of zero for that examination. **It is your responsibility to watch the time and submit the examination in time.** On-line examinations are closed book. You cannot use your text book or note books during the exam, or receive assistance from other people.

If you encounter problems when taking an exam: First try calling me at 806-543-9245. If you are unable to contact me by phone: send me an e-mail and include a phone number where you can be reached. I will contact you ASAP.

Academic Offenses:

Students shall not plagiarize, cheat, or falsify or misuse academic records. [US: 3/7/88; 3/20/89]

PLAGIARISM and CHEATING are serious academic offenses. For additional guidelines about what constitutes plagiarism, see the Academic Ombudsman’s statement

on plagiarism. The full document can be found at <http://www.uky.edu/Ombud/Plagiarism.pdf>

Charges of an academic offense will be made against any student who cheats or commits plagiarism. Penalties for such an offense will be assessed according to University Regulations regarding Academic Offenses.

6.4.3 Initial Determination

A. By the Instructor and Chair

1. **Penalties.** If the student has previously received a penalty for an offense at least as severe as an E or F in a course, the chair shall inform the responsible dean, who shall determine an appropriate penalty pursuant to Section 6.4.3.B.1.b.

Otherwise, if the student has previously received a letter of warning, the instructor must assign a grade of E or F for the course. If the offense is particularly egregious, and if the chair approves, the instructor may also forward the case to the responsible dean with a recommendation for a penalty of XE or XF or a more severe penalty, pursuant to paragraph 6.4.3.B.1.a.

Otherwise, if there are no prior offenses or letters of warning in the student's record, the instructor must award a grade of zero for the assignment on which the offense occurred. The instructor may also choose to impose one of the following additional penalties after consulting with the chair:

- (a) require the student to perform extra academic work (failure to complete the extra work should result in a grade of E or F for the course);
- (b) reduce the final grade in the course by a specified number of levels;
- (c) assign a grade of E or F, as appropriate, for the course;
- (d) if the offense is particularly egregious, and if the chair approves, forward the case to the responsible dean with a recommendation for a penalty of a grade of XE or XF in the course or a more severe penalty, pursuant to paragraph 6.4.3.B.1.a.

If the instructor chooses to impose a penalty less than an E or F in the course, then the offense shall be considered a "minor offense." Generally, an offense that required significant premeditation should not be treated as a minor offense.

NOTE* In addition to the circumstances listed above, the following activities are considered evidence of cheating:

- 1) Any talking to another student during an examination.
- 2) Looking at another students' work during an examination, or allowing another student to look at your work.
- 3) Collaborating with another student on an examination and/or submitting an assignment that is similar in wording or sentence construction to the work of another student in the class, unless the assignment has been identified as a group assignment.

Distance Learning Library Services

(<http://www.uky.edu/Libraries/DLLS>)

- Carla Cantagallo, DL Librarian, Email: dlservice@email.uky.edu
- Local phone number: 859. 257.0500, ext. 2171;
- Long-distance phone number: (800) 828-0439 (option #6)

Student Conduct

Students are expected to maintain decorum that includes respect for other students and the professor, to regularly log in to the course, and to display an attitude that seeks to take full advantage of the educational opportunity. All students are expected to be prepared to work and actively participate in class activities

Virtual communication and discussion "in cyberspace" occur in a social environment where normal rules of social interaction apply. The remoteness of the recipients is no excuse to behave in an anti-social manner and post unacceptable messages.

Unacceptable messages include those that harass, intimidate, threaten, belittle, ridicule, expressed hatred for, or aggression toward others. Let us be mindful to avoid words that imply that some groups of people are less worthy than others (e.g., avoid racist, sexist, anti-Semitic, age-ist, and homophobic language).

Discussion board and other electronic communication for this course should relate only to the course subject matter, generally respond to the instructor threads, and always seek to further the aims of that particular discussion forum or chat session (e.g., stay on topic).

Contributions to discussion boards and synchronous chat are the intellectual property of the authors. Students who quote another person in class projects, publications or even in remarks made on the discussion board should always acknowledge the source of that quote (e.g., do not plagiarize your classmates).

Personal comments about other users and their views should not be placed in any of our Canvas course areas that are viewable by other users.

Do not copy private messages to another person without the author's explicit permission. Consult the UK Student Rights and Responsibilities regarding the steps for addressing unresolved academic issues at <http://www.uky.edu/StudentAffairs/Code/part2.html>

Course Outline:

Class dates	Topics	Readings & Apps Folder
June 9	Course Introduction, Scaling of Universe	Scale of Universe
June 12	The night sky, physical data interpretation critical thinking techniques and science background <i>(Activity #1: Monday, June 13)</i>	Science/Night sky
June 15	The Earth (Stratigraphy, Global Earth) <i>(Activity #2: Thursday, June 16)</i>	Earth
June 19	Volcanoes and Tectonics <i>(Activity #3: Monday, June 20)</i>	Volcano/Tectonics
June 22	Surface age of Earth and Moon <i>(Activity #4: Thursday, June 23)</i>	Surface Age
June 26	Properties of the Moon <i>(Activity #5: Monday, June 27)</i>	Moon
June 29	Interpreting Mars <i>(Activity #6: Thursday, June 30)</i>	Mars Global
July 2	More Mars EXAM #1 (Wednesday, July 6) <i>(Activity #7: Friday, July 8)</i>	Mars Water
July 10	Interpreting Venus Project Topics and groups identified. <i>(Activity #8: Monday, July 11)</i>	Venus surface
July 13	Moons of Jupiter and Saturn <i>(Activity #9: Thursday, July 14)</i>	Large Moons
July 17	Atmospheres, Earth, Venus, Mars, Jupiter <i>(Monday July 18: Project Background)</i>	Atmospheres
July 20	Compositions of Gas Giants <i>(Thursday July 21: Experimental Design)</i>	Gas Giants
July 24	Kuiper belt, Oort cloud, comets <i>(Monday July 25: Data Analysis/Results)</i>	Outer Solar System

July 26	Origin of solar system and extra-solar Planets EXAM#2 (Wednesday, July 27)	Origins
July 29	Catch up on topics <i>(Friday July 29: Conclusions)</i>	
August 4	Final Project papers to be turned in by 1:00 PM on Thursday, August 4th.	