Colonnade Program Course Proposal: Explorations Category

In compliance with the Colonnade Implementation Committee's request, the Department of Geography and Geology submits the following materials for the Exploration course GEOG 121.

1. What course does the department plan to offer in Explorations? Which subcategory are you proposing for this course? (Arts and Humanities; Social and Behavioral Sciences; Natural and Physical Sciences)

The Meteorology Program within the Department of Geography and Geology plans to offer GEOG 121: Meteorology in the Natural and Physical Sciences subcategory within the Explorations Category.

2. How will this course meet the specific learning objectives of the appropriate subcategory. Please address **all** of the learning outcomes listed for the appropriate subcategory.

The course objective of GEOG 121: Meteorology, is to introduce the fundamental processes and elements associated with Earth's atmosphere and weather to produce a comprehensive background in basic meteorology. GEOG 121 has a self-paced lab that engages students in the application of theoretical meteorological concepts learned in the lecture part of the course. GEOG 121 is a required introductory course for Meteorology majors but historically, over 90% of students have been non-majors.

Course objectives for GEOG 121: Meteorology:

Students who complete GEOG 121: Meteorology will be able to:

- Show an understanding of the scientific method and knowledge of natural science and its relevance in our lives.
- Identify the gases of the atmosphere, their relative concentrations, and the significant characteristics of those gases.
- Distinguish between various forms of energy and energy transfer processes as well as distinguish the difference between sensible and latent heat.
- Describe how sun angle and length of daylight change during the year and how these changes produce the seasons.
- Describe how the role of water vapor and carbon dioxide produce the greenhouse effect and discuss the key scientific issues associated with climate change.
- Successfully convert temperature values across the Fahrenheit, Celsius, and Kelvin temperature scales.
- List the four essential climate controls and discuss the basic daily and annual cycles of air temperature.

- Determine various representations of humidity in the atmosphere (e.g., vapor pressure, mixing ratio, dew point, relative humidity, etc.).
- Successfully determine the stability of the atmosphere, given an environmental lapse rate.
- Recognize various cloud types and formation processes along with the different forms of precipitation.
- List and describe the forces that act on the atmosphere to produce wind and recognize wind circulation patterns on a variety of scales.
- Classify air masses and characterize the types of surface fronts that separate them.
- Distinguish the formation processes and scales of mid-latitude cyclones, thunderstorms, tornadoes, and hurricanes.
- Distinguish between watches and warnings for severe thunderstorms, tornadoes, and hurricanes and describe the spatial and temporal risk associated with each severe weather event.
- Distinguish among the various methods of weather forecasting and describe the basics of numerical weather prediction.
- Participate in a forecasting competition.

How these course objectives fulfill the Colonnade Program's four objectives for the Natural and Physical Sciences subcategory of the Explorations Category:

Colonnade Learning Objective 1: Demonstrate an understanding of the methods of science inquiry.

Objective 1 is met by the following course objectives:

- Show an understanding of the scientific method and knowledge of natural science and its relevance in our lives.
- Describe how the role of water vapor and carbon dioxide produce the greenhouse effect and discuss the key scientific issues associated with climate change.

Colonnade Learning Objective 2: Explain basic concepts and principles in one or more of the sciences.

Objective 2 is met by the following course objectives:

- Identify the gases of the atmosphere, their relative concentrations, and the significant characteristics of those gases.
- Distinguish between various forms of energy and energy transfer processes as well as distinguish the difference between sensible and latent heat.
- Describe how sun angle and length of daylight change during the year and how these changes produce the seasons.

- Successfully convert temperature values across the Fahrenheit, Celsius, and Kelvin temperature scales.
- List the four essential climate controls and discuss the basic daily and annual cycles of air temperature.
- Determine various representations of humidity in the atmosphere (e.g., vapor pressure, mixing ratio, dew point, relative humidity, etc.).
- Recognize various cloud types and formation processes along with the different forms of precipitation.
- List and describe the forces that act on the atmosphere to produce wind and recognize wind circulation patterns on a variety of scales.
- Classify air masses and characterize the types of surface fronts that separate them.
- Distinguish the formation processes and scales of mid-latitude cyclones, thunderstorms, tornadoes, and hurricanes.

Colonnade Learning Objective 3: Apply scientific principles to interpret and make predictions in one or more of the sciences.

Objective 3 is met by the following course objectives:

- Successfully determine the stability of the atmosphere, given an environmental lapse rate.
- Distinguish among the various methods of weather forecasting and describe the basics of numerical weather prediction.
- Participate in a forecasting competition.

Colonnade Learning Objective 4: Explain how scientific principles relate to issues of personal and/or public importance

Objective 4 is met by the following course objectives:

- Distinguish between watches and warnings for severe thunderstorms, tornadoes, and hurricanes and describe the spatial and temporal risk associated with each severe weather event.
- Describe how the role of water vapor and carbon dioxide produce the greenhouse effect and discuss the key scientific issues associated with climate change.

3. Syllabus statement of learning outcomes for course. NOTE: In multi-section courses, the same statement of learning outcomes must appear on every section's syllabus.

The following items will appear in all GEOG 121: Meteorology syllabi

Course description: GEOG 121: Meteorology will introduce the fundamental processes and elements associated with Earth's atmosphere and weather and will provide you with

a comprehensive background in basic meteorology. GEOG 121 has a self-paced lab that will engage you in the application of theoretical meteorological concepts learned in the lecture part of the course.

Learning Objectives for Colonnade Program: This course fulfills the Colonnade Program's requirements for the Natural and Physical Sciences subcategory of the Explorations Category. As part of that program, GEOG 121 has the following learning objectives:

Students will demonstrate the ability to:
1. Demonstrate an understanding of the methods of science inquiry.
2. Explain basic concepts and principles in one or more of the sciences.
3. Apply scientific principles to interpret and make predictions in one or more of the sciences.
4. Explain how scientific principles relate to issues of personal and/or public importance

Learning Objectives for GEOG 121: The course objectives for GEOG 121 are designed to integrate fully with the Colonnade Program. Upon successfully completing GEOG 121, you will be able to:

- Show an understanding of the scientific method and knowledge of natural science and its relevance in our lives.
- Identify the gases of the atmosphere, their relative concentrations, and the significant characteristics of those gases.
- Distinguish between various forms of energy and energy transfer processes as well as distinguish the difference between sensible and latent heat.
- Describe how sun angle and length of daylight change during the year and how these changes produce the seasons.
- Describe how the role of water vapor and carbon dioxide produce the greenhouse effect and discuss the key scientific issues associated with climate change.
- Successfully convert temperature values across the Fahrenheit, Celsius, and Kelvin temperature scales.
- List the four essential climate controls and discuss the basic daily and annual cycles of air temperature.
- Determine various representations of humidity in the atmosphere (e.g., vapor pressure, mixing ratio, dew point, relative humidity, etc.).
- Successfully determine the stability of the atmosphere, given an environmental lapse rate.
- Recognize various cloud types and formation processes along with the different forms of precipitation.
- List and describe the forces that act on the atmosphere to produce wind and recognize wind circulation patterns on a variety of scales.
- Classify air masses and characterize the types of surface fronts that separate them.

- Distinguish the formation processes and scales of mid-latitude cyclones, thunderstorms, tornadoes, and hurricanes.
- Distinguish between watches and warnings for severe thunderstorms, tornadoes, and hurricanes and describe the spatial and temporal risk associated with each severe weather event.
- Distinguish among the various methods of weather forecasting and describe the basics of numerical weather prediction.
- Participate in a forecasting competition.

4. Brief description of how the department will assess the course for these learning objectives.

The Department of Geography and Geology will use a two-pronged approach to assess the learning objectives of GEOG 121. The first approach is an assessment developed by Kahl (2008) that was developed to assess learning objectives in an introductory meteorology course primarily geared towards non-majors similar to GEOG 121. The assessment consists of a student survey that is administered at the beginning and end of the semester. The survey is designed to assess student learning in five specific content areas of the course (solar radiation, humidity, winds and forces, weather systems, and climate) that are part of the learning objectives of GEOG 121. Three survey questions were designed for each of the five content areas. The three questions include one basic content question and two application questions designed to measure depth of learning as described by Bloom (1956). The survey design, which follows the Background Knowledge Learning Probe model (Angelo and Cross 1993) allows for quantification of student learning that is independent of previous student knowledge. Based on the experience of Kahl (2008), the goal for GEOG 121 is for 75% of students to show evidence of content learning, 50% of students to show application learning and 25% of students to show deeper application learning. In general, the percentage of students who receive an "A" grade in GEOG 121 should correspond with the percentage of students who show deeper application learning, the percentage of students who receive an "A or B" grade should correspond to the percentage of students who show application learning, and the percentage of students who receive an "A, B, or C" should correspond to the percentage of students who show content learning. As would be expected, students who fail to show evidence of content learning on the assessment will typically earn a course grade of "D or F".

The second assessment tool is a series of pre- and post-test "comfort surveys" that examine student confidence in their knowledge of concepts related to learning objectives by asking, for example, "how comfortable are you discussing the concept of ...." The comfort survey model was developed by Dr. Andrew Wulff in the Geology program and has been used to assess student learning in the introductory Geology courses for several years. The survey scale ranges from 1 (not at all comfortable) to 9 (very comfortable). Students will be given the pre-test comfort survey the first day that material for an exam will be discussed. The post-test will be attached to the end of each exam during the semester. The comfort survey model is not intended to assess the mastery of content directly, but rather student confidence in their mastery of content that is independent of previous student knowledge. Questions on semester exams will be

directly linked to the comfort survey questions which will allow for comparisons between student perceptions of content mastery and actual content mastery. Based on past experiences with this assessment tool, there are three goals; 1) average student "comfort" will improve by three points on the scale from pre-test to post-test for each exam, 2) all content areas for each exam will have an average post-test score of at least 5.0 (somewhat comfortable), and 25% of all students will have an average post-test score of 7.0 (comfortable). The percentage of students who claim an average post-test score of 7.0 should correspond with the percentage of students who receive an "A" grade.

Results from both assessment protocols will be used to evaluate whether or not student learning objectives are being achieved. Results will also be used to improve content and application teaching in both the lecture and lab portions of the class.

References:

Angelo, T. A., and K. P. Cross, 1993: *Classroom Assessment Techniques*. 2nd ed. Jossey-Bass, 448 pp.

Bloom, B. S., 1956: *Taxonomy of Educational Objectives: The Classification of Educational Goals, by a committee of college and university examiners. Handbook I: The Cognitive Domain*. Longmans, 207 pp.

Kahl, J. D. W., 2008: Reflections on a large-lecture, introductory meteorology course. *Bulletin of the American Meteorological Society*, **89**: 1029-1034.

5. How many sections of this course will your department offer each semester?

The Department of Geography and Geology will offer 4-6 sections of GEOG 121 each semester (combined main campus and Glasgow) with a goal of enrolling 80-120 students per semester.

6. Please attach sample syllabus for the course.

See attached.

Approved by Colonnade Committee: 4/4/2013

GEOG 121: Meteorology
(3 credit hours)

Time: Tuesday/Thursday, 9:35 – 10:30 am, EST 328

Instructor: Dr. Greg Goodrich, Associate Professor Office: EST 431
Department of Geography & Geology
Phone: 270 745 5986 Office: 270 745 4555
Email: gregory.goodrich@wku.edu

Office Hours: Tuesday/Thursday 10:30 – 11:30 am (or by appointment)

Required Text: Essentials of Meteorology by C. Donald Ahrens, 4th or 5th edition.
Chapters should be read prior to the discussion of that chapter in class.

Course description: GEOG 121: Meteorology will introduce the fundamental processes and elements associated with Earth's atmosphere and weather and will provide you with a comprehensive background in basic meteorology. GEOG 121 has a self-paced lab that will engage you in the application of theoretical meteorological concepts learned in the lecture part of the course.

Learning Objectives for Colonnade Program: This course fulfills the Colonnade Program's requirements for the Natural and Physical Sciences subcategory of the Explorations Category. As part of that program, GEOG 121 has the following learning objectives:

Students will demonstrate the ability to:
1. Demonstrate an understanding of the methods of science inquiry.
2. Explain basic concepts and principles in one or more of the sciences.
3. Apply scientific principles to interpret and make predictions in one or more of the sciences.
4. Explain how scientific principles relate to issues of personal and/or public importance

Learning Objectives for GEOG 121: The course objectives for GEOG 121 are designed to integrate fully with the Colonnade Program. Upon successfully completing GEOG 121, you will be able to:

- Show an understanding of the scientific method and knowledge of natural science and its relevance in our lives.
- Identify the gases of the atmosphere, their relative concentrations, and the significant characteristics of those gases.
- Distinguish between various forms of energy and energy transfer processes as well as distinguish the difference between sensible and latent heat.
- Describe how sun angle and length of daylight change during the year and how these changes produce the seasons.
- Describe how the role of water vapor and carbon dioxide produce the greenhouse effect and discuss the key scientific issues associated with climate change.

- Successfully convert temperature values across the Fahrenheit, Celsius, and Kelvin temperature scales.
- List the four essential climate controls and discuss the basic daily and annual cycles of air temperature.
- Determine various representations of humidity in the atmosphere (e.g., vapor pressure, mixing ratio, dew point, relative humidity, etc.).
- Successfully determine the stability of the atmosphere, given an environmental lapse rate.
- Recognize various cloud types and formation processes along with the different forms of precipitation.
- List and describe the forces that act on the atmosphere to produce wind and recognize wind circulation patterns on a variety of scales.
- Classify air masses and characterize the types of surface fronts that separate them.
- Distinguish the formation processes and scales of mid-latitude cyclones, thunderstorms, tornadoes, and hurricanes.
- Distinguish between watches and warnings for severe thunderstorms, tornadoes, and hurricanes and describe the spatial and temporal risk associated with each severe weather event.
- Distinguish among the various methods of weather forecasting and describe the basics of numerical weather prediction.
- Participate in a forecasting competition.

Course Format: Two 55-minute lectures per week and a self-paced lab session.

Class Attendance: Attendance in lecture will not be recorded as part of the course grade but attending lecture is **highly** recommended. Out of fairness to the entire class, I will not loan or make available my lecture notes. If it is necessary that you miss a lecture, please borrow the notes of a fellow student. Afterward, I will be happy to answer additional questions during office hours.

> If a student will miss a class period due to a university-sanctioned activity, Western Kentucky University requires that the student: (1) identify himself/herself prior to missing the class, (2) provide the instructor with a copy of their travel schedule, and (3) discuss with the instructor the procedure to make up missed work.

Academic Honesty: Cheating absolutely will not be tolerated. Students are expected to adhere to the Western Kentucky University Code of Student Conduct.

Please turn off cell phones during class!!

Disability Services: In compliance with university policy, students with disabilities who require academic and/or auxiliary accommodations for this course must contact the Office for Student Disability Services in Downing University Center, A-200. The phone number is 270 745 5004.

Please DO NOT request accommodations directly from the professor or instructor without a letter of accommodation from the Office for Student Disability Services.

Student Evaluation: Two mid-term exams and one final exam will comprise 75% of the grade for this course. The exams will consist of multiple choice and true/false questions and will be computer graded. By the nature of this course, all exams will be cumulative although each exam will focus on the specific chapters outlined in the syllabus. The self-paced lab will make up the remaining 25% of the course.

Make-up exam policy: You must inform me or the departmental secretary within 36 hours of the scheduled exam that will be/was missed. If you fail to receive approval for a make-up exam within this time frame you will not be allowed a make-up for any reason. A grade of "0" will be given in these instances.

Grades:

Three exams		300 points
Overall lab score		100 points
		400 points possible

A	90-100%	
B	80-90%	
C	70-80%	All grades subject to curve at end of semester
D	60-70%	
F	<60%	

There will be no extra credit of any kind given on an individual basis in this course.

Required Materials: Bring a #2 pencil and calculator for the exam.

Self-paced Lab: Lab is required for this course. The meteorology lab is located upstairs in Room 425 ESTB. The lab will be open several hours per week at times published in a schedule which will be given to you. The schedule will be prepared from the time preferences expressed by the meteorology students currently enrolled as modified by the availability of lab instructors. The lab procedure is as follows:

1. Fill out the lab card, which is provided by her or him.
2. All exercises must be accomplished in the lab. The lab instructors will assist you.
3. Lab cards must remain in the lab at all times.
4. Turn in the completed lab card to the instructor each time you leave the lab.
5. Lab assignments completed after the due date (see syllabus schedule) receive no credit.

Departmental Drop Policy: The Department of Geography and Geology strictly adheres to the course drop policy found in the Undergraduate and Graduate Catalogs. It is the sole responsibility of individual students to meet the cited deadlines for dropping a course. In exceptional cases, the deadline for schedule changes (dropping a course) may be waived. The

successful waiver will require written description of extenuating circumstances and relevant documentation. Poor academic performance, general malaise, or undocumented general stress factors are not considered as legitimate extenuating circumstances.

9/4: *Last day to drop a course w/out grade.* **10/17:** *Last day to drop a course with a W.*

Any updates to this syllabus, including the course outline, will be given in class

Tentative course outline

Date	Topic	Tuesday	Thursday	Lab
8/27-8/31	Introduction	Intro	1	
9/3-9/7	Earth Atmosphere	1	2	Lab 1 **Due 9/7**
9/10-9/14	Warming the Earth	2	3	Lab 2 **Due 9/14**
9/17-9/21	Air Temperature	3	4	Lab 3 **Due 9/21**
9/24-9/28	Humidity and Condensation	4	Review	Lab 4 **Due 9/28**
10/1-10/5		**Exam 1**	**No Class**	Fall Break
10/8-10/12	Clouds and Precipitation	5	5	Lab 5 **Due 10/12**
10/15-10/19	Air Pressure and Winds	6	6	Lab 6 **Due 10/19**
10/22-10/26	Atmospheric Circulations	7	7	Lab 7 **Due 10/26**
10/29-11/2		Review	**Exam 2**	Lab 8 **Due 11/2**
11/5-11/9	Air Masses	**No Class**	8	Lab 9 **Due 11/9**
11/12-11/16	Fronts	8	9	Lab 10 **Due 11/16**
11/19-11/23	Weather Forecasting	9	**No Class**	Thanksgiving
11/26-11/30	Severe Weather	10	10	Lab 11 **Due 11/30**
12/3-12/7	Hurricanes	11	11	
12/10-12/14	**Final Exam**	**1:00-3:00 pm**	**Monday**	**12/10**