Course Description
PH 111. Introduction to Meteorology. 4 hours credit. This course will enable the student to examine the physical properties of the atmosphere, radiation heating and cooling, precipitation, clouds, weather disturbances, climate controls, map readings and application of the scientific method in analysis of the weather elements. The student will also produce written works as appropriate to the discipline.

Required Materials
For complete material(s) information, refer to https://bookstore.butlercc.edu

Butler-Assessed Outcomes
The intention is for the student to be able to
1. Interpret and analyze current weather conditions using weather maps and imagery, recognizing patterns depicted by isobars, fronts, and local weather elements.
2. Recognize the elements of weather and climate: solar radiation, temperature, moisture, pressure and winds, air masses and fronts and atmospheric disturbances.
3. Describe the origin of severe weather.
4. Recognize and explain optical phenomena in the atmosphere.

Learning PACT Skills that will be developed and documented in this course
Through involvement in this course, the student will develop ability in the following PACT skill area(s):

Analytical Thinking Skills
• Critical thinking - Through the production of mathematical, graphical, experimental, and written assignments, the student will demonstrate scientific reasoning.

Communication Skills
• Creation and delivery of message – Through research and assignments, the student will gain knowledge of weather related elements.

Technology Skills
• General computer use - Through electronic-facilitated research and manipulation of data, the student will develop basic computer skills.

Major Summative Assessment Task(s)
These Butler-assessed Outcome(s) and Learning PACT skill(s) will be demonstrated by
1. Completing laboratory reports including purpose, procedures, observations, and analysis of the experiment using scientific reasoning (A-skill and T-skill).
2. Writing a research paper or preparing a project on a topic of meteorology (C-skill).

Skills or Competencies
These actions are essential to achieve the course outcomes:
1. Use of basic computer skills.
2. Solve basic mathematical problems related to the sciences.

**Learning Units**

I. Monitoring weather
   A. Interpret and utilize satellite imagery
   B. Analyze surface weather maps and upper air charts
   C. Recognize fronts from patterns depicted by isobars on surface weather maps
   D. Discuss the intricacies and limitations of weather forecasting

II. Atmosphere: origin, composition and structure
   A. Describe the composition of the atmosphere and how it evolved over time
   B. Identify the components and properties of the four major layers of Earth’s atmosphere

III. Solar and terrestrial radiation
   A. Integrate the relationships between solar radiation and Earth in generating weather
   B. Explain the cause and mechanism of the natural greenhouse effect.
   C. Describe the relationships between the sun and the earth that cause the seasons

IV. Elements of weather and climate
   A. Differentiate among conduction, convection, and radiation
   B. Describe the role of moisture in the atmosphere, including concepts such as evaporation, condensation, cloud formation, and precipitation
   C. Identify different cloud types and explain their occurrences
   D. Recognize the different types of fog and precipitation and explain why each occurs
   E. Analyze the concept of atmospheric pressure and its effects on weather and wind
   F. Illustrate the Coriolis Effect and its implications for wind patterns
   G. Identify and name the four major air masses and the concept of source regions
   H. Identify and name the four major types of fronts, and the weather that they generate
   I. Discuss mid-latitude cyclones and anticyclones and their effect on U.S. weather

V. Severe weather
   A. Describe the life cycle of a thunderstorm
   B. Explain why lightning occurs
   C. Describe the origin and development of severe weather such as hurricanes and tornadoes

VI. Human modification of the climate
A. Recognize global weather patterns and climatic zones and explain their distribution
B. Relate the mechanisms of both the anthropogenic greenhouse effect and ozone layer depletion to how human activity impacts the atmosphere

VII. Optical phenomena
A. Explain why the sky is blue
B. Describe why rainbows and other optical phenomena form

Learning Activities
Learning activities will be assigned to assist the student to achieve the intended learning outcome(s) through lecture, instructor-led class discussion, guest speakers, group activities, drills/skill practice, labs, and other activities at the discretion of the instructor. These activities may be either face-to-face or online.

Grade Determination
The student will be graded on learning activities and assessment tasks. Grade determinants may include the following: daily work, lab reports, research papers, quizzes, chapter or unit tests, comprehensive examinations, projects, presentations, class participation, and other methods of evaluation at the discretion of the instructor.