



DEPARTMENT OF SCIENCE
COURSE INFORMATION SHEET FOR
MET101 – METEOROLOGY

All members of the Science Department at Clinton Community College use the respective course templates as a basis for their course syllabi. Faculty may, at their discretion, change the order of the course content or add course content.

COURSE NUMBER AND TITLE: MET101 - Meteorology

COURSE SECTION: *TBA*

CONTACT HOURS: 5 **CREDIT HOURS:** 4

SEMESTER AND YEAR: *TBA*

INSTRUCTOR'S NAME, TELEPHONE NUMBER, EMAIL ADDRESS, OFFICE NUMBER, AND OFFICE HOURS: *TBA*

I. COURSE DESCRIPTION:

Meteorology is a course designed for the student who would like to learn more about weather phenomenon. This course explores atmospheric phenomena such as the nature and variability of the wind, temperature, cloud and precipitation as well as the Earth's energy budgets. Emphasis is placed upon the various terminology and tools that meteorologists employ to observe, study and predict storm systems, the development and movement of fronts, as well as thunderstorms and tornadoes. Current topics such as the El Nino, climate modification and air pollution will also be addressed. There are three hours of lecture and one two-hour laboratory per week.

II. PREREQUISITE AND COREQUISITE: MAT 100 or equivalent

III. COURSE OBJECTIVES:

As the result of instructional activities, students will be able to:

1. Describe and define in detail the structure, composition, and formation of the Earth's atmosphere.
 - List the major and minor components of the Earth's atmosphere.
 - Define the layers of the Earth's atmosphere and their important features.
 - Explain how the Earth's atmosphere was formed.
2. Understand and describe solar radiation, the Earth's heat budget, and seasons.
 - Discuss the causes of the seasons and the significance of the solstices and equinoxes.
 - Explain the difference between heat and temperature.
 - Describe the difference between kinetic and potential energy.
 - Describe convection, conduction, and radiation.

- Describe what happens to incoming solar radiation as it passes through the atmosphere.
 - Explain the greenhouse effect and how Earth's atmosphere is heated.
 - Describe Earth's heat budget and latitudinal heat balance.
3. Understand and describe the Earth's energy balance and temperature.
 - Discuss the factors that contribute to the differential heating and cooling of land and water.
 - Describe the influence of ocean currents, altitude, geographic position, cloud cover, and albedo on temperature.
 - Discuss daily and annual temperature variations.
 - Explain wind chill and heat index.
 4. Describe and define the major processes involved with atmospheric moisture.
 - Describe the movement of water through the hydrologic cycle.
 - Discuss the processes and energy requirements by which water changes from one state of matter to another.
 - Define absolute humidity, mixing ratio, vapor pressure, relative humidity, and dew point.
 - Discuss the adiabatic process and its role in cloud formation.
 - State the four mechanisms that cause air to rise.
 - List the atmospheric conditions which determine the stability of air.
 - List the factors that modify the stability of air.
 5. Describe and define the processes involved for cloud development, the forms of clouds, and the processes involved for precipitation.
 - Describe the process of condensation and the role of condensation nuclei in the formation of clouds.
 - Discuss the basis of cloud classification and list the major cloud types based on their form and height.
 - Explain the formation of the various types of fog, dew, and frost.
 - Describe the formation of precipitation according to the Bergeron process and the collision-coalescence process.
 - Distinguish among rain, snow, sleet, glaze, hail, and rime and describe the circumstances under which each forms.
 - Describe how precipitation is measured using standard instruments and weather radar.
 6. Understand and define the major processes involved with atmospheric pressure and winds.
 - Define air pressure, and explain how it is measured.
 - Discuss pressure changes with increasing altitude.
 - Describe how the pressure-gradient force, the Coriolis effect, and friction each affect the wind.
 - Define an isobar and read a weather map.
 - Discuss winds aloft and geostrophic flow.
 - Explain cyclonic and anticyclonic airflow.
 - Describe surface winds and the forces that promote vertical airflow.

7. Discuss and define the types, models, and processes involved with atmospheric circulations and pressure distributions.
 - Explain the difference between macroscale, mesoscale, and microscale winds.
 - Discuss the three-cell circulation model of the atmosphere.
 - Identify each of Earth's idealized zonal pressure belts.
 - Discuss the locations and causes of the major monsoons.
 - Discuss the westerlies and polar jet stream.
 - Describe the relation between global winds and ocean currents.
 - Describe the occurrence and effects of El Niño and La Niña.
8. Discuss and define the different types of air masses and fronts and their origin.
 - Define an air mass and discuss air mass classification.
 - Describe the ways air masses are modified.
 - List the source regions and properties of air masses that influence the weather of North America.
 - Distinguish between warm fronts, cold fronts, stationary fronts, occluded fronts, and drylines.
9. Understand in detail mid-latitude cyclones and the processes involved in their creation.
 - Discuss in detail the life cycle of a midlatitude cyclone.
 - Summarize the idealized weather associated with a midlatitude cyclone as it passes completely over a region.
 - Explain cyclogenesis and the nature of cyclonic and anticyclonic circulation.
10. Describe and define the development and conditions needed to produce lightning, thunder, and tornadoes.
 - Describe the stages of development of an air-mass thunderstorm.
 - Summarize the characteristics of severe thunderstorms, supercell thunderstorms, squall lines, and mesoconvective complexes.
 - Discuss the atmospheric conditions that produce lightning and thunder.
 - Discuss the development, occurrence, destruction, and detection of tornadoes.
11. Understand the types, formation, detection, and warnings of tropical storms and hurricanes.
 - Discuss the formation and decay of hurricanes.
 - Describe the difference between a tropical disturbance, tropical depression, tropical storm, and hurricane.
 - Explain the Saffir-Simpson hurricane scale.
 - Describe how satellites, aircraft, radar, and data buoys are used to detect and track hurricanes.
 - Explain the difference between a hurricane watch and a hurricane warning.
12. Understand the techniques and processes involved with weather forecasting.
 - Describe the different approaches used in modern weather forecasting.
 - Discuss short and long-range forecasts and their accuracy.
 - Describe how satellites and other tools are used in modern weather forecasts.
 - Explain the role of upper-level flow in preparing weather forecasts.
13. Understand and discuss the effects of humans on air pollution.
 - List the major primary and secondary pollutants and identify their sources.
14. Explain and discuss climate change, both natural and man-made causes.

- Explain the methods used to detect climate change.
 - Summarize natural mechanisms of climate change that are unrelated to human activities.
 - Discuss the greenhouse effect of the atmosphere and how the addition of carbon dioxide, trace gases, and aerosols has modified global temperature.
 - List and summarize several possible consequences of greenhouse warming.
15. Discuss the nature of light and optical phenomena.

IV. REQUIRED TEXTBOOK AND MATERIALS:

REQUIRED TEXTBOOK:

1. Understanding Weather & Climate, 4th edition, Edward Aguado and James E. Burt, Pearson/Prentice Hall
ISBN# 0-13-149696-4
2. Exercises for Weather and Climate, 6th edition, Greg Carbone, Pearson/Prentice Hall
ISBN# 0-13-149701-4

REQUIRED MATERIALS:

Safety glasses are required for all on-campus sections.

V. METHODS OF INSTRUCTION/COURSE ORGANIZATION: *To be determined by the respective instructor.*

VI. ATTENDANCE PROCEDURE (INCLUDING MAKEUP POLICY): *To be determined by the respective instructor.*

VII. BIBLIOGRAPHY OF READINGS (IF APPLICABLE): *To be determined by the respective instructor.*

VIII. METHODS OF EVALUATION (INCLUDING THE CALCULATION OF COURSE GRADE): *To be determined by the respective instructor. The methods of evaluation shall include tests (test types, length and weight of each), papers (weight of each), projects (weight of each), and other forms of evaluation (weight of each).*

IX. GRADING SCALE: *To be determined by the respective instructor. The grading scale shall indicate what numerical scores correspond to the following grades: A, A-, B+, B, B-, C+, C, C-, D+, D, and F.*

Please Include: If you have, or suspect you may have, any type of disability or learning problem that may require extra assistance or special accommodations, please speak to me privately after class or during my office hours as soon as possible so I can help you obtain any assistance you may need to successfully complete this course. You should also contact Laurie Bethka, Room 420M in the Academic Assistance Center, for further assistance.

X. GENERAL TOPICS OUTLINE:

1. Composition and structure of the atmosphere

2. Solar Radiation and the Seasons
3. Energy and temperature
4. Atmospheric pressure and wind
5. Atmospheric moisture
6. Clouds
7. Precipitation processes
8. Atmospheric circulation and pressure distributions
9. Air masses and fronts
10. Mid-latitude cyclones
11. Lightning, thunder, and tornadoes
12. Tropical storms and hurricanes
13. Forecasting and Analysis
14. Air pollution
15. Climate and climate changes
16. Atmospheric Optics

XI. ACADEMIC INTEGRITY: Academic honesty is expected of all Clinton Community College students. It is academically dishonest, for example, to misrepresent another person's work as one's own, to take credit for someone else's work or ideas, to accept help on a test, to obtain advanced information on confidential test materials, or to intentionally harm another student's chances for academic success.

XII. COURSE CONTINUITY PLAN: In the case that the college officially closes because of an emergency which causes a short term disruption of this course, we will utilize e-mail to continue this course in the short term (1-3 weeks). All students need to utilize their campus e-mail to receive course related information.