



Math 230: Euclidean Geometry for College Students
Spring 2024
CRN 2499, MWF 1:00-1:50 at SH203
Course Format: Face-to-Face
3 Credits – 45 Hours

INSTRUCTOR INFORMATION

Instructor: Pai Song
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Department: Science and Mathematics
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Office Hours:

MWF: 11:00 am – 12:00 am; TR: 9:00 am – 9:30 pm; R: 1:00 pm – 1:30 pm.

Other times are available by appointment. If you need to contact me outside my office hours or class time, please send me an email. I check my email several times a day and will usually respond within 24 hours.

COURSE DESCRIPTION

Catalog Description:

This course is designed to ensure a thorough understanding of the fundamental concepts of the Euclidean plane and solid geometry; study of polygons, circles, constructions, and proofs. This course is more heavily proof-based than a first course in Euclidean geometry and will serve as an example of an axiomatic approach.

Expanded Course Description:

This course will familiarize students with fundamental properties of two-dimensional and three-dimensional geometric shapes and to foster an appreciation for the usefulness of geometry. They will also deepen students' conceptual understandings of geometry by constructing proofs to verify geometric relationships and by using those relationships to solve applied problems. Participants will explore a wide variety of geometry and measurement problems and theorems through structured tasks designed to develop a profound understanding of the multiple roles that geometry and measurement play in mathematics.

Prerequisites:

A student must satisfy one of the following:

- ACT Math score of 21 or higher
- SAT Math score of 530 or higher
- MATH 106 with a grade of C or higher

Course Goal:

The goal of this course is to improve and enhance the fundamental skills of Euclidean geometry through investigating geometric postulates and theorems, writing deductive proofs, and solving applied problems. An emphasis will be placed on designing and solving a variety of geometric problems using inductive and deductive reasoning.

Course Objectives:

Upon completing this course, the student should be able to ...

1. Explain the differences between inductive and deductive reasoning.
2. Describe the need for undefined terms and postulates in a deductive reasoning system.
3. Identify the relationship between Euclid's Fifth Postulate and non-Euclidean geometries.
4. Perform geometric constructions with compass and straightedge.

5. Prove theorems using a two-column approach and a paragraph approach.
6. Apply properties of triangles.
7. Apply properties of parallel lines.
8. Apply theorems about interior and exterior angles of polygons.
9. Apply properties of parallelograms, trapezoids, rectangles, squares, and rhombi.
10. Classify and chart the relationships among general quadrilaterals, parallelograms, trapezoids, rectangles, squares, and rhombi.
11. Discover a formula describing the number of diagonals of a polygon in terms of the number of vertices.
12. Find areas of circles, polygons, and shapes made up of, or that can be approximated by, circles, sectors of circles, and/or polygons.
13. Derive the formula for the area of a circle through a visual argument that incorporates areas of rectangles and the concept of a limit.
14. Discover the Pythagorean Theorem through a measuring activity and prove it through a paper-cutting activity that relies on analytic geometry.
15. Apply the Pythagorean Theorem.
16. Apply concepts from geometry to the field of trigonometry.
17. Apply formulas for surface area and volume of three-dimensional figures.
18. Apply properties of chords, tangents, and secants to circles.
19. Research and write a paper about a person from the history of geometry, present findings orally to the class, and participate in a discussion of the human history of geometry.

Relationship to National and State Teaching Standards:

Participation in this course will encourage the student to develop a thorough understanding of the fundamental concepts of formal and informal geometry, and it will include discussions on problem-solving skills and pedagogical insights into teaching geometry at different programmatic levels. Students will develop skills in writing deductive proofs and drawing geometric constructions. The course objectives support the following NCTM/CAEP secondary mathematics content standards:

- A.3.1: Core concepts and principles of Euclidean geometry in two and three dimensions.
- A.3.2: Transformations including dilations, translations, rotations, reflections, glide reflections; compositions of transformations; and the expression of symmetry in terms of transformations.
- A.3.3: Congruence, similarity and scaling, and their development and expression in terms of transformations.
- A.3.4: Right triangles and trigonometry.
- A.3.6: Identification, classification into categories, visualization, and representation of two- and three-dimensional objects.
- A.3.7: Formula rationale and derivation of two- and three-dimensional objects with attention to units, unit comparison, and the iteration, additivity, and invariance related to measurements.
- A.3.8: Geometric constructions, axiomatic reasoning, and proof.
- A.3.9: Analytic and coordinate geometry including algebraic proofs.
- A.3.10: Historical development and perspectives of geometry and trigonometry including contributions of significant figures and diverse cultures.

Relationship to Mathematics Minor:

This course will provide opportunities for students in the mathematics minor “to broaden and deepen their mathematics experiences and skill.” Participation in this course will encourage the student to apply mathematical skills in their major area of study; which will have better prepared them for employment or additional study in those areas. The course objectives support the following learning outcomes for the mathematics minor:

- Use mathematical models to represent and understand quantitative relationships.
- Develop and evaluate mathematical arguments and proof.
- Demonstrate knowledge of the historical development of mathematics including contributions from diverse cultures.

COURSE REQUIREMENTS

Textbook:

Daniel C. Alexander, GERALYN M. KOEBERLEIN (2020). *Elementary Geometry for College Students (7th edition)*. Cengage Learning, Inc., ISBN: 978-1337614085

Other Materials:

The following supplies are required for this course: pencil/pen, paper, binder, protractor, straightedge, and a scientific calculator. The following supplies are highly recommended but not required: scissors, tape, glue, notebook, graph paper, and colored pencils/markers.

Methods of Evaluation:

Course grades will be based on participation, homework, group research project, tests, and final exam. The weighted grade values are given below:

Method of Evaluation	Percentage
<u>Participation:</u> Class participation will be based on class attendance, discussion of select topics, cooperative group activities, student presentations, in-class activities, and module summaries. You are expected to participate and attend every class session; missed class sessions will result in a zero on in-class exercises and/or class discussions, unless other arrangements have been made with the instructor. Updated every week.	5%
<u>Homework:</u> Homework (problem sets, independent study, small projects, and/or writing exercises) will be assigned for each topic discussed in the course. You must complete all assigned problems in order to receive credit. Partially completed homework assignments will receive no credit. You should record all work and notes in a math notebook, this will help you later when studying for tests and exams. You are allowed to use a calculator, notes, textbooks, internet resources, and receive help from others on homework assignments, but you should understand what you have done before submitting it to the instructor.	25%
<u>Tests:</u> You will be required to complete three online module tests throughout the semester; each test will be based on course material within that particular module. You will have two attempts for each test, and you will only have one hour to complete each test. You will be graded on both accuracy and mathematical reasoning so you must show all work and/or explain your reasoning to receive full credit. See departmental grading rubric for additional details about partial credit. You are allowed to use a graphing calculator on all tests. You are not allowed to use notes, textbooks, formula sheets, internet resources, communication devices, or receive help from others. All tests must be taken on the indicated dates unless other arrangements have been made with the instructor. Module tests will be administered according to the following schedule (may change slightly due to unforeseen circumstances): • Test 1: Friday, February 2, 2024 • Test 2: Friday, March 1, 2024 • Test 3: Friday, April 5, 2024	45%
<u>Comprehensive Final Exam:</u> The final exam will be comprehensive and will consist of multiple choice, true/false, matching, and completion problems. The final exam will be given on Thursday, May 2, 1:00 pm – 3:00 pm . The final exam must be taken on the indicated date unless other arrangements have been made with the instructor. You will only have two hours to complete the exam. It is your responsibility to complete the exam by the date indicated above. You are allowed to use a calculator on the exam. You are not allowed to use notes, textbooks, formula sheets, internet resources, communication devices (including cell phones), or receive help from others on the exam. If you are caught cheating on the exam, then you are subject to the penalties describe in the Glenville State College's Academic Dishonesty policy.	25%
<u>Extra Credit:</u> There will be no extra credit opportunities available for this course unless offered to all students in the course.	

Grading Scale:

100-90% = A	400-360 points = A
89-80% = B	359-320 points = B
79-70% = C	319-280 points = C
69-60% = D	279-240 points = D
59-0% = F	239-0 points = F

Departmental Grading Rubric:

Open response questions on quizzes and exam will be graded on accuracy and mathematical reasoning. You must show all work and/or explain your reasoning to receive full credit. The rubric may be modified slightly depending on the point value of the open response question, but the weights will remain the same. Below is the departmental rubric used for grading each problem on each quiz and/or exam:

	Exemplary	Acceptable	Developing	Unacceptable
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Mathematical Knowledge and Strategy	4 points: Shows complete understanding of the problem's mathematical concepts and principles. An efficient and sophisticated strategy is chosen and progress towards a solution is evaluated. Adjustments in strategy, if necessary, are made along the way, and/or alternative strategies are considered. Evidence of analyzing the situation in mathematical terms, and extending prior knowledge is present. Applies procedures accurately to correctly solve the problem and verifies the results. Explanation shows complete understanding of the mathematical concepts used to solve the problem.	3 points: Shows some understanding of the problem's mathematical concepts and principles. A correct strategy is chosen based on the mathematical situation in the task. Planning or monitoring of strategy is evident. Evidence of solidifying prior knowledge and applying it to the problem solving situation is present. A systematic approach and/or a justification of correct reasoning are present. Applies procedures to correctly solve the problem, but may contain minor errors or missing steps. Explanation shows substantial understanding of the mathematical concepts used to solve the problem.	2 points: Shows limited understanding of the problem's mathematical concepts and principles. A partially correct strategy is chosen, or a correct strategy for only solving part of the task is chosen, or an inappropriate strategy for solving the problem is chosen. Evidence of drawing on some previous knowledge is present, showing some relevant engagement in the task. Some correct reasoning or justification for reasoning is present with trial and error, or unsystematic trying of several cases. Explanation shows limited understanding of the mathematical concepts needed to solve the problem.	0 points: Shows no understanding of the problem's mathematical concepts and principles. No strategy is chosen, or a strategy is chosen that will not lead to a solution. There is little or no evidence of engagement in the task present. Neither correct reasoning nor justification for reasoning is present. There were so many errors in the mathematical procedures that the problem could not be solved. Explanation shows no understanding of the underlying concepts needed to solve the problem or no explanation is provided.
Accuracy of Solution		1 point: The student provided a correct solution to the problem and included all required parts to the solution (units, mathematical symbols, rounding, simplified form, extraneous solutions, etc).	0.5 points: The student provided a correct solution to the problem, but did not include all required parts to the solution or provide incorrect parts to the solution (units, mathematical symbols, rounding, simplified form, extraneous solutions, etc)	0 points: The student did not provide a correct solution to the problem.

Weekly Schedule of Reading and Other Assignments:

The outlined course readings and assignments may change throughout the semester; however, the topics outlined below will be followed as closely as possible. Changes in the schedule may occur due to unforeseen circumstances; you will be notified of the changes to the schedule and/or assignments by your instructor.

Course Schedule is available on class [website](#).

Make-Up Work Course Policy:

It is your responsibility to complete all assignments and take all tests/exams **on or before the due date**. Late online assignments will be accepted with penalty (**5% deduction per day, this is only for the questions completed after the due date**), unless PRIOR arrangements have been made with the instructor. **Any person who must miss a scheduled test and/or exam**

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because of an official college function as deemed by the Office of Academic Affairs must reschedule with the instructor PRIOR to the function; otherwise, the student will not be given an opportunity to make-up the test and/or exam.

Note: For online program students, you must take the proctored tests/final on campus if you live on campus or within 50 miles of campus; others you will have an approved proctor. Proctor form will be provided by your course instructor.

Attendance Course Policy:

Attendance is required for all classes. To be in compliance with federal guidelines, students are expected to be present at all class sessions to be eligible for financial aid through Title IV of the Higher Education Act of 1965. It may be necessary for the student to be absent from scheduled classes or laboratories for personal reasons. On such occasions, all matters related to a student's absence are to be arranged between the student and the instructor, including making up missed work. The student is responsible for the academic consequences of any absences. **Absence from more than 4 class meetings will be grounds for removal from the class. If you are also enrolled in Math 115S (a support course for Math 115), each weekly assignment with less than 80% accuracy will be counted as an absence toward this Math 115 course.**

Occasionally, students may be absent from scheduled classes to participate in officially sanctioned college activities referred to hereafter as institutional absences. Instructors are obligated to respect institutional absences and may not penalize a student for such an absence if said students make up any graded work missed due to the absence in a timely manner as determined by the instructor. An institutional absence does not change deadlines for submitting assignments, but faculty will allow students to make up exams, quizzes, presentations, or any other course requirements that have an impact on the course grade conducted during the missed class(es). Students are responsible for all coursework missed due to absences and must initiate any request to make up coursework in a timely manner, as stipulated by the instructor on their syllabi. Instructors must allow students missing class for institutional absences to make up any work conducted in class but, at the discretion of the instructor, may assign alternate, equivalent work. Instructor accommodations for requested make-up work must be reasonable and timely; such accommodations may be made prior or subsequent to the institutional absence at the discretion of the instructor. A list of students who are excused during a specific time period will be maintained by the Office of Academic Affairs and circulated to instructors.

In addition, instructors may excuse absences due to extenuating circumstances beyond student control, as though they are institutional absences. However, if an instructor chooses to excuse such absences, they must excuse them consistently for all students. Furthermore, at the instructor's discretion, an instructor may require the student to provide documentation of the circumstances leading to the absence and approve or deny the request for an excused absence based on said documentation. At the beginning of each semester, all instructors will provide in the course syllabi a clearly written statement to all their classes regarding their policies in handling absences. Students and instructors are obligated to adhere to the stated requirements of each course. An instructor's attendance policy may not contradict institutional policy.

Additionally, attendance is required for all online courses. Attendance is defined as active and timely participation and submission of assigned coursework, discussions, exams, or other materials as defined by course instructors. Logging into a course does not constitute attendance. In order to document attendance for financial aid purposes, students must submit an assignment during the first week of scheduled classes. Students who stop attending an online course after week one may remain enrolled in the course or instructors may initiate policy procedures for Administrative Withdrawal as outlined in the Glenville State College Catalog. Guidelines for the duration of non-attendance will be outlined in the course syllabus. Students must complete the proper withdrawal procedures if they wish to withdraw from the course prior to the last day to withdraw from an individual course with a grade of W. Students who stop attending a course or courses after the first week and who do not officially withdraw or who are not administratively withdrawn will receive a grade of FIW (Failure due to Irregular Withdrawal).

Online students may have approved institutional absences that conflict with the due date of assigned work. Students are responsible for keeping track of assignment deadlines that may occur during institutional absences and make prior alternative arrangements with their instructor to complete these assignments.

***Note: Faculty are expected to report excessive absences to the Office of the Registrar on a regular basis.**

Withdrawal Information:

If for any reason you believe that you may be unable to complete the course, please talk with your instructor and/or advisor before withdrawing from the course. The withdrawal deadline is [Friday, March 15, 2024](#).

Academic Dishonesty:

Glenville State College requires adherence to the College's standards of academic integrity. While every case of academic dishonesty cannot be listed exhaustively, the following examples represent some basic types of behavior that are unacceptable and also represent those items for which students may be sanctioned.

1. *Cheating*: using unauthorized notes, mechanical or electrical devices (calculators, PDAs, cell phones, etc.), study aids, or information on an examination; making unauthorized changes to graded work and misrepresenting those changes as instructor grading error; allowing another person to do one's work and submitting that work under one's own name; submitting identical or similar papers for credit in more than one course without prior permission from the course instructors.

2. *Plagiarism*: To plagiarize is, according to *Webster's Third New International Dictionary*, "To commit literary theft." Writers or speakers plagiarize if they use words, ideas, or arguments, of another and make it appear that these materials are their own. To avoid the charge of plagiarism when using materials derived from another, the writer should follow accepted conventions of punctuation, indentation, and documentation. A handbook of composition will provide a list of these conventions.

Glenville State College defines Plagiarism as:

1. Quoting material from a particular source, such as a text, article, or Internet page, or email, without indicating the source and without placing the directly quoted material within quotation marks;
2. Taking the ideas or arguments of another person without acknowledging the source of the ideas or arguments;
3. Substituting synonyms for an author's words but preserving the sentence structure or mixing the author's words or phrases within the paraphrasing and failing to put the author's words in quotation marks. Citing the source does not excuse you from the charge of plagiarism;
4. Using a theme (paper or essay) or portion of a theme written by someone else. For example, plagiarism occurs if an individual takes or purchases an essay from an Internet service or uses someone else's essay from a previous semester or another class.

Any assignment that is turned in either for credit or review that has been plagiarized will be subject to sanctions of academic dishonesty.

3. *Fabrication*: falsifying or inventing any information, data or citation; presenting data that were not gathered in accordance with standard guidelines defining the appropriate methods for collecting or generating data and failing to include an accurate account of the method by which the data were gathered or collected.

4. *Obtaining an Unfair Advantage*: (a) stealing, reproducing, circulating or otherwise gaining access to examination materials prior to the time authorized by the instructor; (b) stealing, destroying, defacing or concealing library materials with the purpose of depriving others of their use; (c) unauthorized collaborating on an academic assignment (d) retaining, possessing, using or circulating previously given examination materials, where those materials clearly indicate that they are to be returned to the instructor at the conclusion of the examination; (e) intentionally obstructing or interfering with another student's academic work, or (f) otherwise undertaking activity with the purpose of creating or obtaining an unfair academic advantage over other students' academic work.

5. *Aiding and Abetting Academic Dishonesty*: (a) providing material, information, or other assistance to another person with knowledge that such aid could be used in any of the violations stated above, or (b) providing false information in connection with any inquiry regarding academic integrity.

6. *Falsification of Records and Official Documents*: altering documents affecting academic records; forging signatures of authorization or falsifying information on an official academic document, grade report, letter of permission, petition, drop/add form, ID card, or any other official College document.

7. *Unauthorized Access*: to computerized academic or administrative records or systems: viewing or altering computer records, modifying computer programs or systems, releasing or dispensing information gained via unauthorized access, or interfering with the use or availability of computer systems or information.

*All students must sign and date a copy of the Academic Dishonesty Policy.

Academic Misconduct Statement:

Disorderly and/or disruptive behavior in the classroom setting may result in an academic penalty such as final course grade, grade penalty, exclusion from class, etc. when the course instructor has provided written notice to the student. Such notice may be provided via the course syllabus or specific written notification (with copy to advisor). Any member of the campus community may also file an incident report regarding alleged misconduct with Student Affairs for possible sanction in accordance with the Student Conduct Code. Appeals of academic penalty will be referred to the Academic Appeals Panel and will be governed by the Student Academic Grievance Policy. Appeals of sanctions imposed under the Student Conduct Code will be reviewed in accordance with the processes outlined in the Code (see Student Handbook for details). Incident reports of alleged student misconduct are permanently maintained in the Office of Student Affairs.

Internet service/Hardware/Software Needed:

For GSC on campus students but live off campus, or any students who are absent due to quarantine/institutionally approved reasons, you will need access to a computer (a laptop or a desktop) with an internet connection to be able to access the resources and homework assignments on MyLab Math.

For online program (all courses are web-based) students, you will need access to a computer (a laptop or a desktop) with an internet connection to be able to access the resources and homework assignments on MyLab Math, and a webcam to use Lockdown Browser.

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Electronic Digital Communication Device Use Statement:

Glenville State College values the time and effort involved in the learning process. Interruptions caused by rings and musical selections from electronic digital communication devices interrupt and disrespect the opportunities for student learning in the classroom environment.

When in the college classroom, all electronic digital communication devices must be turned off and out of sight. Laptop computers may be used only for course-related activities with instructor permission. There may be no conversations via electronic digital communication device, whether audible or text-messaging, while in the Glenville State College classroom. In an emergency situation, the instructor may give a student permission to use an electronic digital communication device. The instructor has the right to ask the student to leave the classroom for the remainder of the class period if the student uses an electronic digital communication device during class. If the student leaves the room to speak on an electronic digital communication device, it is at the instructor's discretion as to whether or not the student may return to the classroom when the conversation is completed.

Study Expectations:

You are expected to participate in each class session, and you are expected to spend a minimum of 6 additional hours each week for completing activities that are directly related to this course, such as: problem sets, select readings, instructional videos, and studying for tests and exams. Please note that this expectation is a minimum expectation. It is your responsibility to budget your time to complete the course. It is your responsibility to email and notify the instructor if you are having difficulties in completing assignments or if something arises in your schedule that will briefly keep you from progressing.

Assignment Expectations:

You should make the work which you submit as neat and organized as possible. This makes it easier for you to review it later, and it makes it easier for your instructor to grade. You are also less likely to make mistakes if your work is well organized and legible. The instructor may return work for revision which is sloppy, difficult to read, or which needs re-organized. In extreme cases, the instructor may require a student to type his or her work.

Calculator Usage:

Graphing calculators at or below the level of a TI-84 Plus are required for this course. Any student using a calculator other than a TI-84 shall inform the instructor of the model being used, and the student must receive approval for its use. Students using an approved calculator other than the TI-84 Plus are responsible for its proper operation and use. TI-89 calculators or other computer algebraic systems (CAS) are not allowed; in addition, calculators on cell phones, iPods, tablets, or any other devices are not allowed (except with permission from the instructor for in-class activities). It will be considered cheating if you use a non-approved device on an exam; in addition, sharing a calculator with another student(s) during an exam will be considered cheating for all individuals involved. Calculators will not be provided so it is your responsibility to bring one to class. You may rent a calculator from the Science and Math Department, if you do not wish to purchase one. The Science and Math Department will rent calculators on a first-come-first serve basis. Students wishing to rent a calculator will be asked to provide a deposit of \$100 for the cost of the calculator; upon return of the calculator in working condition at the end of the course all but \$10 of the deposit will be refunded to the student.

Food/Drink:

No food and/or drinks are allowed in the classroom at any time.

Other Course Policies:

- Be on time. Once the door is closed, tardy students may not be admitted.
- Notify the instructor if you plan on being absent from a class.
- **NO assignments will be reset on Cengage. It is your responsibility to complete all work on time.**
- Don't wait until the last minute to complete online assignments, technology has not been perfected.
- The use of any electronic devices is STRICTLY PROHIBITED (Calculators are an exception).
- Disruptive or disrespectful behavior WILL NOT be tolerated.
- Absences on exam days will result in a grade of ZERO. NO MAKE-UP EXAMS WILL BE GIVEN. It is your responsibility to notify instructor in advance of absence on exam day.

Tutoring/Additional Support:

There are several tutoring/support services available if you are having difficulties in completing course assignments and/or studying for tests/exams.

- Some students may be eligible for tutoring through the Student Support Services.

- Departmental tutoring will be available to any students enrolled in a mathematics course at Glenville State College. The departmental tutoring program will consist of peer tutors and instructors, and it is located in the Math Center on the second floor of the Science Hall, Room 209.
- Students are encouraged to use the instructor's office hours for additional support in the course. Special study sessions may be available.
- Instructional videos on BrightSpace will be available if there is any class need to be cancelled due to instructor's absence.

ADA Students Statement

"It is the policy of Glenville State College to provide reasonable accommodations for qualified individuals with documented disabilities. This College will adhere to all applicable federal, state and local laws, regulations and guidelines with respect to providing reasonable accommodations with regard to affording equal educational opportunities. It is the student's responsibility to provide documentation of a disability to the Academic Success Center located on the third floor of the Robert F. Kidd Library. The staff will assist students and faculty in arranging appropriate accommodations. This is in accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990."

Course Evaluations

Course evaluations are a critical way for students to share constructive criticism with faculty about the class. Students are encouraged to share what they felt were strengths and areas of improvement in the course. All student comments are collected anonymously.

College-wide Policies

All college policies are in effect during this course for relevant policy and procedures in the classroom.

Reserve Clause

The instructor reserves the right to revise, alter, or amend this syllabus as necessary. Students will be notified in writing / e-mail of any such changes.

Force Majeure

The duties and obligations of Glenville State College may be modified or suspended immediately and without notice because of force majeure causes beyond Glenville's reasonable control and occurring without its fault or negligence including, but not limited to, acts of God, fire, war, governmental action, terrorism, epidemic, pandemic, weather, national emergencies, or other threats to the safety of students, faculty, or staff. If such an event occurs, Glenville's duties and obligations may be modified, suspended, or postponed until such time as Glenville, in its sole discretion, may safely resume operations. Glenville may, at its option, and in its sole discretion, alter the academic year schedule or provide alternate means of instruction, including, but not limited to, distance or remote learning.