NC 228B: INTEGRATED MATH IIIB

Citrus College Course Outline of Record

Heading	Value
Effective Term:	Fall 2022
Credits:	0
Total Contact Hours:	60
Lecture Hours :	60
Lab Hours:	0
Hours Arranged:	0
Outside of Class Hours:	120
Prerequisite:	Placement by high school counselor or math placement exam.
Transferable to CSU:	No
Transferable to UC:	No
Grading Method:	Non-Credit Course

Catalog Course Description

It is in the Mathematics 3 course that students integrate and apply the mathematics they have learned from Integrated Math 1 and 2. This course includes standards from the conceptual categories of Number and Quantity, Algebra, Functions, Geometry, Statistics and Probability. 60 lecture hours.

Course Objectives

- Analyze givens, constraints, relationships, and goals.
- Plan a solution pathway rather than simply jumping into a solution attempt.
- Try special cases and simpler forms of the original problem in order to gain insight into its solution.
- Construct viable arguments and critique the reasoning of others.
- Create a coherent representation of the problem at hand.
- Understand and use stated assumptions, definitions, and previously established results in constructing arguments.
- Analyze situations by breaking them into cases, recognize and use counterexamples.
- Reason inductively about data making plausible arguments that take into account the context from which the data arose.
- Model with mathematics.
- Apply knowledge and be comfortable making assumptions and approximations to simplify a complicated situation realizing that these may need revision later.
- Identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and formulas.
- Use clear definitions in discussion with others and in their own reasoning.
- State the meaning of the symbols they choose, including using the equal sign consistently and appropriately.
- Discern a pattern or structure.
- Notice if calculations are repeated and look both for general methods and shortcuts.

Major Course Content

1. Inferences and Conclusions from Data
   a. Collecting and Interpreting data
2. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
   a. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. (For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?)
3. Evaluating collections
4. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
   a. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
   b. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
   c. Evaluate reports based on data.
   d. Normal Distribution
5. Students determine confidence intervals for a simple random sample from a normal distribution of data and determine the sample size required for a desired margin of error.
   a. Students determine the P-value for a statistic for a simple random sample from a normal distribution.
6. Standard Deviation
7. Students know basic facts concerning the relation between the mean and the standard deviation of a sampling distribution and the mean and the standard deviation of the population distribution.
   a. Best Fit Lines
8. Students find the line of best fit to a given distribution of data by using least squares regression.
   a. Probability
9. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
   a. Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).
10. Trigonometry of General Triangles and Trigonometric Functions
    a. Angles of any measure
11. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
    a. Negative and Positive Angles
12. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
    a. Reference Angles
13. Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for x, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number.

   a. Radian Measures
14. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
15. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angles as the constant of proportionality; derive the formula for the area of a sector.
16. Convert between degrees and radians.
   a. Sine, Cosine, Tangent, any angle/relative to Radian Measure
17. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
   a. Trigonometric Equation for Area of Triangle
18. Derive the formula sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
   a. Law of Sine and Cosine
   b. Prove the Laws of Sines and Cosines and use them to solve problems.
   c. Application Problems
   d. Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
19. Polar Coordinates
20. Graph polar coordinates and curves. Convert between polar and rectangular coordinate systems.
   a. Cartesian Coordinates/Vectors
21. Represent and model with vector quantities.
   a. Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v).
22. Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
23. Solve problems involving velocity and other quantities that can be represented by vectors.
24. Conversion between Polar and Cartesian
   a. Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
25. Graphing Periodic Functions (amplitude, frequency, and midline)
26. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
27. Writing Equations from Graphs and Writing Graphs from Equations
28. Create equations that describe numbers or relationships.
29. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
30. Mathematical Modeling
   a. Effects of Transformations on Graphs
31. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
32. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.
33. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x +k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
   a. Inverse Functions
34. Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
35. Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.
   a. Operations between Functions
36. Demonstrated an understanding of functions and equations defined parametrically and graph them.
   a. Relationships between Two- and Three-Dimension Objects
37. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
38. Know that the effect of a scale factor k greater than zero on length, area, and volume is to multiply each by , respectively; determine length, area and volume measures using scale factors.
   a. Geometric Applications
39. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
   a. Apply concepts of density based on area and volume in modeling situations (e.g. persons per square mile , BTU's per cubic foot).
   b. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
   c. Make Conclusions based on Empirical Data (viable arguments, critique)
40. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
   a. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
   b. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
   c. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

Examples of Required Writing Assignments

When looking at inverse functions and discussing exponential growth and decay models, students will be asked to sketch a graph and write on how the values for "h" and "k" change the graph and the domain, range, and asymptotes.

Examples of Outside Assignments

There will be homework given on a daily basis along with some performance tasks that will need additional time outside of class.

Instruction Type(s)

Lecture, Online Education Lecture