

Discrete Mathematics with Statistics and Probability 3135

Course description:

Discrete Mathematics with Statistics and Probability is an advanced course that includes using discrete structures to represent and determine solutions to problem situations; collecting, representing, and processing data; and applying probability in problem-solving.

Standard 1.0: Discrete Mathematics

Students will investigate meaningful problems individually or in cooperative groups, while using appropriate technology, to apply discrete structures to represent and solve problems.

Learning Expectations:

The student will:

- 1.1 use discrete structures to represent problem situations;
- 1.2 apply inductive and deductive reasoning to discrete problem situations;
- 1.3 apply discrete ideas and structures to solve a variety of problems.

Student Performance Indicators:

- apply discrete ideas to solve real-world problems (i.e. election theory, group ranking, and estate planning);
- demonstrate an understanding of the elements, subsets, properties, operations of sets;
- use valid forms of deductive reasoning and logic to make and evaluate arguments;
- represent and solve problems using discrete structures such as finite graphs, matrices, and sequences (e.g. Leslie Model, Leontief Model, Markov Chain, and cryptographic techniques);
- use vertex-edge graphs to solve network problems such as finding circuits, critical paths, minimum spanning trees, and adjacency matrices;
- analyze and use discrete ideas such as induction, iteration, and recurrence relations to solve problems from such fields as Chaos Theory, Map Problems, and fractals;
- create tessellations using reflection, rotation, and translation.

Standard 2.0: Probability

Students will expand basic concepts of probability and apply those concepts to represent and solve problems.

Learning Expectations:

The student will:

- 2.1 demonstrate an understanding of probability distributions;
- 2.2 apply experimental and theoretical probability in problem solving;

Student Performance Indicators:

- apply number theory topics such as the Fundamental Theorem of Arithmetic, lowest common denominator, greatest common factor, etc. to solve problems using modular arithmetic;
- create and interpret discrete probability distributions;
- use experimental or theoretical probability, as appropriate, to represent and solve problems involving uncertainty;
- derive and use formulas to calculate combinations and permutations;

understand and apply the concept of a random variable to generate and interpret probability distributions including binomial, uniform, normal, and Chi Square; apply game theory to problem solving.

Standard 3.0: Statistics

Students will select and use appropriate representations and statistical methods to analyze data collected from real-world situations.

Learning Expectations:

The student will:

- 3.1 formulate questions and design appropriate studies;
- 3.2 select and use appropriate representations to summarize data;
- 3.3 select and use appropriate statistics to analyze data.

Student Performance Indicators:

design a statistical experiment to study a problem, conduct the experiment, and communicate and interpret the outcomes;

understand and apply measures of central tendency, variability, and correlation to summarize data and draw inferences from real-world situations;

understand sampling and recognize its role in statistical claims;

conduct and interpret tests for significance using appropriate statistics;

use curve fitting to make predictions from data;

construct and draw inferences from charts, tables, and graphs that summarize data from real-world situations.