Math 230 Course Content and Objectives

COURSE CONTENT AND SCOPE - **Lecture:** Outline the topics included in the lecture portion of the course *(Outline reflects course description, all topics covered in class).*	Hours Per Topic	COURSE OBJECTIVES - **Lecture:** Upon successful completion of this course, the student will be able to...*(Use action verbs - see Bloom's Taxonomy for 'action verbs requiring cognitive outcomes.')*
Sets, subsets, Venn diagrams, set operations, and infinite sets.	5	Describe a set, determine if two sets are equal, determine if two sets are equivalent, determine if a set is a subset of another set. Work with Venn diagrams, perform the set operations of union, intersection, complement, difference, and Cartesian product. Determine if a set is infinite, countable, or uncountable.
Systems of numeration: Additive, multiplicative, ciphered, place-value. Egyptian, Hindu-Arabic, Roman, Chinese, Ionic Greek, Babylonian, and Mayan numerals. Converting from base 10 numerals to numerals in other bases and vice versa. Addition, subtraction, multiplication, and division in other bases. Duplation, mediation, lattice method, and Napier's rods.	6	Express numerals in the Egyptian, Roman, Chinese, Ionic Greek, Babylonian, and Mayan systems. Convert numerals from one base to another. Perform basic computations in different bases. Use duplation and mediation, lattices, and Napier's rods to multiply two numbers.
Logic, statements and logical connectives, truth tables for negation, conjunction, disjunction, the conditional, and the biconditional, equivalent statements, symbolic arguments, and Euler diagrams and syllogistic arguments.	6	Explain what a statement is. Write down compound statements using logical connectives. Construct a truth table for compound statements. Determine whether a compound statement is a self-contradiction, tautology, or an implication. Determine whether two statements are equivalent. Apply De Morgan's laws to compound statements. Determine the converse, inverse, and contrapositive of a conditional statement. Determine whether a symbolic argument is valid or a fallacy. Apply the standard forms of arguments: Law of detachment, law of contraposition, law of syllogism, and disjunctive syllogism. Able to recognize invalid arguments such as the fallacy of the converse, or the fallacy of the inverse. Determine the validity of a syllogistic argument by Euler diagrams.
The metric system, basic units, conversions, length, area, volume, mass and temperature, dimensional analysis, and conversions to and from the metric system.	5	Write numbers using the metric prefixes. Convert numbers within the metric system. Determine length, area, volume, mass, and temperature in the metric system. Apply dimensional analysis to perform conversions to and from the metric system.
Geometry, points, lines, planes, and angles. Polygons, similar figures, and congruent figures. Perimeter and area. Pythagorean	5	Describe the axiomatic method of Euclidean geometry. Determine if two figures are similar or

theorem. Circles. Volumes. Transformational geometry, symmetry, and tessellations. The Mobius strip and Klein bottle. Non-Euclidean geometry and fractal geometry.		congruent. Compute the area and perimeter of a polygon. Compute the volume and surface area of solid shapes. Apply Euler's polyhedron formula to polyhedra. Perform transformational operations on plane figures. Create unique tessellations from a square, equilateral triangle or a hexagon. Make a Mobius strip. Determine whether two shapes are topologically equivalent. Calculate the genus of a solid object. Discuss non-Euclidean geometry in terms of the fifth axiom of geometry. Create fractals.
Mathematical systems, groups, properties of groups, finite mathematical systems, clock arithmetic, modulo m systems, and modular arithmetic.	6	Determine whether a mathematical system is a group. Perform clock arithmetic. Perform modular arithmetic.
Consumer mathematics, percent increase and decrease, simple interest, compound interest, present value, fixed and open-ended installment loans, mortgages, annuities, sinking funds, and retirement investments.	7	Calculate the percent change, percent markup and percent markdown. Apply the simple interest formula to installment buying. Apply the United States rule and the banker's rule to repayment of a loan. Apply the compound interest formula to a savings account. Determine the present value of a future amount. Determine the finance charge and the monthly payment of a fixed installment loan. Apply the actuarial method for unearned interest. Calculate the minimum monthly payment of an open-end installment loan. Determine the finance charge on an open-end loan using the unpaid balance method or the average daily balance method. Create an amortization schedule for a mortgage. Calculate the accumulated amount or future amount of an annuity by the ordinary annuity formula. Apply the sinking fund payment formula to find the payment needed to reach a future amount.
Graph theory, graphs, paths, circuits, the Konigsberg bridge problem. Euler paths and Euler circuits. Hamilton paths and Hamilton circuits, Traveling salesman problems, brute force method, nearest neighbor method. Trees, spanning trees, and minimum-cost spanning trees.	6	Define a graph. Represent a map by a graph. Determine Euler paths and circuits on a graph. Determine Hamilton paths and circuits on a graph. Use the brute force method or the nearest neighbor method to solve the traveling salesman problem. Define a tree. Determine spanning trees from graphs. Solve the minimum-cost spanning tree problem by Kruskal's Algorithm.

Voting and apportionment. Preference tables, voting methods, flaws of voting methods, standard quotas and standard divisors. Apportionment methods and the flaws of apportionment methods.	6	Determine the outcome of an election by four different methods: Plurality, Borda count, plurality with elimination, and pairwise comparison. Describe the four fairness criteria and their relevance to the Arrow impossibility theorem. Compute the standard divisor and the standard quota used in apportionment problems. Solve an apportionment problem by Hamilton's method, Jefferson's method, Webster's method and/or Adams's method. Explain the Alabama paradox, the population paradox, and the new-states paradox in relation to Hamilton's method. Give the consequences of the Balinski and Young's impossibility theorem.
Final examination.	2	Final examination.
Total: Total Lecture Hours In Section I Class Hours:	54 54	