SM242 Discrete Mathematics **Fall 2012 Syllabus**

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Text: Chapter numbers are from *Discrete Mathematics with Applications,* Susanna Epp, Thomson Brooks/Cole, 4th Edition.

Motivation:

- (Instructor notes): What is discrete math and why study it; relevant topics; history of mathematical thought; course material overview.

Sets:

- [1.2, 6.1]: Notation; empty set; subset; equality; Venn diagrams; union, intersection, difference, complement; disjoint sets; partitions; power set; Cartesian product.

Linear algebra/matrices:

- Vectors (Instructor notes): Definition; norm, inner and cartesian product.
- Matrices (Instructor notes)[10.3]: Definition; identity, inverse, transpose, multiplication.

Relations:

- [1.3, 8.1 – 8.3]: Definition; representations; binary relation; reflexivity, symmetry, transitivity; equivalence relations.

Functions:

- [1.3, 7.1 – 7.3] Definitions; one-one, onto, one-one correspondence.
- [7.4] Cardinality and Countability.

Numbers:

- Number Theory (Instructor notes) [4.8, 7.4, 8.4]: Integers, rationals, irrationals, reals, primality, divisibility/Fundamental Theorem of Arithmetic, GCD/Euler's Algorithm, congruence/modular arithmetic; quotient/remainder.

- Discrete representation of numbers (Instructor notes): largest decimal integer representable in N bits (unsigned/signed); discrete representation of real numbers: normalized scientific notation; smallest/largest representable real; unrepresentable reals/floating point accuracy.

Compound and Quantified Logic

- [2.1 -2.4] Logical forms; logical implication; digital logic; argument.
- [3.1 – 3.4] Predicates; quantified statements; argument.
- (Instructor notes)[2.3] Fallacies

Proof:

- [4.1 – 4.8] Direct proof; counterexample; contradiction; contraposition.
- [5.1 – 5.3] Sequences; summations; mathematical induction.
- [6.2 – 6.4] Proofs of set properties.
- [8.4] Proofs in number theory.

Recursion:

- [5.6 – 5.8] Recursive sequences; recurrence relations.

Counting and Probability:

- [9.1 – 9.9] Permutations; combinations; sample space; multiplication and addition rules; expected value; Bayes rule.