CS 032: Discrete Mathematics

Term: 2020 Summer Session **Instructor: Staff** **Language of Instruction: English** **Classroom: TBA** **Office Hours: TBA**
Class Sessions Per Week: 5 **Total Weeks: 5** **Total Class Sessions: 25** **Class Session Length (minutes): 120** **Credit Hours: 4**

Course Description:

This course gives an introduction to basic ideas and techniques in discrete mathematics, focusing on its use in engineering and computer science. Topics covers chapter 2 to chapter 11 in textbook including: Logic Propositions and Proof Techniques, Set Theory, Functions and Relations, Recursions, Graph Theory, Counting and Probability, Algorithm and Complexity Analysis of Algorithms.

Learning Objectives:

Upon completion of this course, students are expected to:

- be able to learn and understand basic topics in mathematical logic and be able to construct formal proofs in propositional and predicate logic.
- be able to learn and understand functions, sets, relation, graphs and their applications.
- to understand and use different types of counting techniques and their application.
- to understand recursions and its application in computer science.
- to be able to understand the basics about algorithm and its complexity analysis.
- to be able to apply knowledge in discrete mathematics to solve problems

Course Materials:

Discrete Mathematics with Applications, by Susanna S. Epp (Author)

Publisher: Cengage Learning; 5 edition (January 1, 2019)

ISBN-10: 1337694193

ISBN-13: 978-1337694193

Course Format and Requirements:

The class period will consist of an active learning environment. During a majority of the class time, students will be actively working on problems under the instructor's guides. During the class meetings the text will be supplemented with more rigorous theory and special topics.

Attendance:

Attendance will not be taken but is strongly recommended. Each student will have three allowed absences and no grade deduction will be made for the first three absences. More than three unexcused absences will result in an automatic reduction in your participation grade, for instance from A- to B+. Your active participation in the class is expected and encouraged.

Grading Scale:

A+: 98%-100%
A: 93%-97%
A-: 90%-92%
B+: 88%-89%
B: 83%-87%
B-: 80%-82%
C+: 78%-79%
C: 73%-77%
C-: 70%-72%
D+: 68%-69%
D: 63%-67%
D-: 60%-62%
F: Below 60%

Course Assignments:

Homework Assignment:

There will be 2 homework assignment for each week and 8 in total. Homework assignment will help you review the most important point in class and it will not be so difficult as long as you have a active participation in class. No late homework is accepted. This will account for 10% of your final grade.

Quizzes:

There will be 6 unannounced quizzes through this semester. Each quiz will be on the material covered in previous chapters. All of the quizzes will be closed book and the lowest score will be dropped in final grading. No make-up quizzes will be given. The quizzes will account for 15%of your final grade.

3 individual Projects:

There will be 3 projects based on course need. These projects are all individual work. Students are encouraged to exchange and discuss knowledge and ideas together. But each student shall submit completed individual work.

The projects aim to enrich students' knowledge on application of learned ideas, concepts and techniques. It will count for 15% of your grade for the course.

Exams (One Midterm Exam + Final Exam)

Both exams will be based on the knowledge covered in class, open book and open note.

Note that the final is cumulative and it will not be taken during the normal class times. Exact time and location for final will be announced later.

No excuse will be accepted if students do not have legitimate excuses for absence. Physician Statement is required for missing the exam due.

Course Assessment:

8 Homework Assignment	10%
Quizzes(5 out of 6)	15%
Weekly projects	15%

Midterm Exam	25%
Final Exam	35%
Total	**100%**

Academic Integrity:

Students are encouraged to study together, and to discuss lecture topics with one another, but all other work should be completed independently.

Students are expected to adhere to the standards of academic honesty and integrity that are described in the Shanghai Normal University's Academic Conduct Code. Any work suspected of violating the standards of the Academic Conduct Code will be reported to the Dean's Office.

Penalties for violating the Academic Conduct Code may include dismissal from the program. All students have an individual responsibility to know and understand the provisions of the Academic Conduct Code.

Special Needs or Assistance:

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.

Course Schedule:

Week	Topics	Activities
Week 1 (Class 1-5)	Reading Syllabus, Course Introduction Logical Form and Logical Equivalence, Statements; Truth Values; Compound Statements; tautologies and Contradictions Conditional Statements; Necessary and Sufficient Conditions. Valid and Invalid Arguments	Homework Assignment Quizzes 1 & 2

	Predicates and Quantified Statements; Quantifier; Statements with Multiple Quantifier; Translating from Informal to Formal Language; Formal Logical Notation; Arguments with Quantified Statements Existential Statement, Universal Statement, Writing proofs of Universal Statement, Variations among Proof, Common mistakes, Proof Collection, Conjecture, Proof and Disproof; Proving properties of Rational Numbers, Proving Properties of Divisibility;	
Week 2 (Class 6-10)	Quotient Theorem and Examples, Alternative Representations Integers, number theory and application, Absolute value and the Traigle Inequality; Proof by Contradiction, Argument by Contraposition, Two Classical Theorems of Indirect Argument, other open questions in Number theory. Subset, Set Equality, Venn Diagram, Sets Operations, Empty Sets, Sets Partitions, Power Sets, CartesianProducts; Proving Set Identity and Proving a Set is the Empty Set Disproof, Algebra proof, Boolean Algebras Function Terminology, Boolean Functions, Functions acting on Set; One-to-One functions, Onto Functions, Hash Functions,Relations between Exponential and Logarithmic Functions Inverse Functions; Composition of Functions.	Homework Assignment Quiz 3 Project 1
Week 3 (Class 11- 15)	Relations Examples, The inverse Of a Relations, Directed Graph of a Relation; N-ary Relations and	

	Relationaldatabase 3 properties of Relations(Reflexive, Symmetric andTransitive), The Properties of Relations on a Infinite Sets, The closure of a Relation Equivalence Relations Antisymmetry; Partial Order Relations; Lexicographic Order; Hasse Diagrams; Partially and Totally Ordered Sets; Topological Sorting Graph definitions and Basic Properties, Trails, Path, and Circuits, Matrix Representations of Graphs, Isomorphisms and Trees Sequences, Summation and Product; Sequence in Programming Induction; Proof of an equality; Sum of a Geometric Sequence; Inductive Reasoning; Proving Inequalities; Strong Mathematical Induction	Homework Assignment Quiz 4 Project 2 Review Midterm
Week 4 (Class 16-20)	An Algorithmic Language; A Notation for Algorithms; Trace Tables; The Division Algorithm; The Euclidean Algorithm; Correctness of the Division Algorithm; Correctness of the Euclidean Theorem Recurrence; Solve Recurrence Relations by Iteration; General Recursive Definitions and Structural Induction; Recursive Functions. Sample Space and Event; Probability in the Equally Likely Case; Possibility Trees; The Multiplication Rule; Counting Elements of Disjoint Sets; Permutations;	Homework Assignment Quiz 5 Project 3

	Permutations of Selected Elements; the pigeonhole principle; Combinations r-Combinations with repetition allowed Pascal's Formula and the Binomial Theorem	
Week 5 (Class 21-25)	Probability Axioms, Expected Value, Conditional Probability Bayes' Formula, Independent Events Graph of a Function; Power Functions; The Floor Function; Graphing Functions Defined on Sets of Integers; Graph of a Multiple of a Function; Increasing and Decreasing Functions General Properties of O-Notations; Orders of Power Functions; Orders of Polynomial Functions; Orders for Functions of Integer Variables; Computing Orders of Simple Algorithms; The Sequential Search Algorithm; The Insertion Sort Algorithm; Time Efficiency of an Algorithm Exponential and Log Functions Binary Search; Divide-and-Conquer Algorithms; The Efficiency of the Binary Search Algorithm; Merge Sort; Tractable and Intractable Problems	Homework Assignment Quiz 6 Review Final Exam