MATH 3425: Discrete Mathematics

2023 Summer Session	
Total Class Sessions: 25	**Instructor: Staff**
Class Sessions Per Week: 5	**Classroom: TBA**
Total Weeks: 5	**Office Hours: TBA**
Class Session Length (Minutes): 145	**Language: English**
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 including: Logic Propositions and Proof Techniques, Mathematical Induction, Elementary Set Theory, Functions and Relations, Recursions, Basic Number Theory and Graph Theory, Counting and Discrete Probability.

Student Learning Outcomes:

Upon completion of this course, students are expected to:

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

Course Materials:

Textbook：

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:

This course has 25 class sessions in total. Each class session is 145 minutes in length. Pre-reading the relevant chapter and attempting the assigned homework problems prior to

each class is strongly recommended. Familiarizing with the course material before class, you will gain a better understanding of the information presented during the class. Students are strongly encouraged to ask questions on things they do not understand. Main learning points will be highlighted from the relevant textbook chapters.

Attendance

Students are expected to attend and participate in class. Strong attendance and participation are good indicators of success. Each student is responsible for all course material, announcements, quizzes and exams made in class, whether or not the student attended that day's class.

Course Assignments and Assessment:

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.

8 Homework Assignment	10%
Quizzes(5 out of 6)	15%
3 Individual projects	15%
Midterm Exam	25%
Final Exam	35%

Total	**100%**

Grading Scale (percentage):

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

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 Chengdu University of Technology'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
1.	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 **Chapter 2** Predicates and Quantified Statements; Quantifier; Statements with Multiple Quantifier; Translating from Informal to Formal Language; Formal Logical Notation; Arguments with Quantified Statements	Homework Assignment Quiz 1

	Chapter 3	
2.	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; 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. **Chapter 4** Subset, Set Equality, Venn Diagram, Sets Operations, Empty Sets, Sets Partitions, Power Sets, Cartesian Products; Proving Set Identity and Proving a Set is the Empty Set Disproof, Algebra proof, Boolean Algebras **Chapter 6** 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. **Chapter 7**	Homework Assignment Quiz 2 and 3 Project 1
3.	Relations Examples, The inverse Of a Relations, Directed Graph of a Relation; N-ary Relations and Relational database 3 properties of Relations(Reflexive, Symmetric and Transitive), 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 **Chapter 8** Graph definitions and Basic Properties, Trails, Path, and	Homework Assignment Review Midterm Quiz 4 Project 2

	Circuits, Matrix Representations of Graphs, Isomorphisms and Trees **Chapter 10**	
4.	Sequences, Summation and Product; Sequence in Programming Induction; Proof of an equality; Sum of a Geometric Sequence; Inductive Reasoning; Proving Inequalities; Strong Mathematical Induction **Chapter 5** 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 **Chapter 4.9** 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; Permutations of Selected Elements; the pigeonhole principle; Combinations **Chapter 9**	Homework Assignment Quiz 5 Project 3
5.	r-Combinations with repetition allowed Pascal's Formula and the Binomial Theorem Probability Axioms, Expected Value, Conditional Probability Bayes' Formula, Independent Events **Chapter 9 (Cont.)** 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	Homework Assignment Quiz 6 Final Exam

	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 **Chapter 11**	