Estd 1864

Forman Christian College
(A Chartered University)
Department of Mathematics
Spring 2023

Instructor Information:

Name: Dr. Ahmad Mahmood Qureshi

(Associate Professor & Dean Faculty of Computer and Mathematical Sciences)

Office: S - 204 (Armacost Building)

Office Hours: Tuesday and Thursday (12:30 PM to 02:00 PM).
OTHERWISE GET APPOINTMENT FIRST

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Course Information:

Course Code and Title: MATH 303: Discrete Mathematical Structures **Credits:** 3

Prerequisite: MATH 101 (Pre-Calculus and Trigonometry) or *A-level Mathematics or Intermediate Mathematics*

Class Room: S - 216

Lectures Time: Tuesday and Thursday (11:00 AM – 12:15 PM)

Text Book: Discrete Mathematics with Applications, 4th Edition by Susanna S. Epp.

Reference: Discrete Mathematics and its Applications, 7th Edition by Kenneth H. Rosen.

Course Introduction:

Discrete Mathematical Structures is the study of distinct and separable objects such as statements in logic, integers, combinations and graphs. This contrasts with "continuous mathematics" where we study real numbers, trigonometry, or calculus.

The course will help students develop the ability to express mathematical thoughts precisely and rigorously. It will also provide an essential foundation for computer science.

Our goal is to expose students some new topics and to build mathematical maturity by studying rigorous mathematical proofs and by solving problems using rigorous mathematical arguments.

The principal topics presented in this course are:
Propositional logic, propositional equivalence, valid and invalid arguments, predicate logic and quantifiers, methods of proofs (direct and indirect proofs), mathematical induction and the well-ordering principle, relations and functions, pigeonhole principle, counting techniques, introduction to graphs.

Course Objectives:

The purpose of this course is to:

1. Provide solid foundation of mathematical logic that lays the ground of mathematical reasoning and mathematical argument.
2. Develop the ability on performing combinatorial analysis to solve counting problems.
3. Prepare the students to develop mathematical foundations for courses in computer science and graph theory.

Learning Outcomes:

After successfully completing this course, the students would be able to:

1. Write an argument using logical notation and determine if the argument is valid or not.
2. Demonstrate the ability to outline a proof structure by applying suitable proof techniques.
3. Count without enumerating objects using counting techniques.
4. Use their skills to work with discrete structures that include sets, relations, functions and graphs.
5. Develop the mathematical know-how required for an in-depth study of the science and technology of the computer age.

Course Requirements:

Students are expected to attend every class. A s**tudent whose attendance is less than 70% won't be allowed to take the final exam**.

Students must arrive at class on time and **those coming after attendance call won't be marked present. Inside the classroom Mobile phones will remain switched off.**

Working regularly, comprehending the lectures, doing assignments will be very helpful in quizzes, mid-term and final to get a good grade. **Your ability of problem solving will be a reflection of your grades.**

Course Evaluation:

Grading will be based on following criteria:

Class Participation and behavior	10%
Quizzes/Assignments	20%
Mid Term	30%
Final Exam	40%

Grades	Quality Points	Numerical Value	Meaning
A	4.00	93-100	Superior
A-	3.70	90-92	
B+	3.30	87-89	
B	3.00	83-86	Good
B-	2.70	80-82	
C+	2.30	77-79	
C	2.00	73-76	Satisfactory
C-	1.70	70-72	
D+	1.30	67-69	
D	1.00	60-66	Passing
F	0.00	59 or below	Failing

Course Outline:

Week	Topics	Pages in Text Book
1	Discussion of Course Plan Logical Form and Logical Equivalence	Pages: 23 - 38
2	Conditional Statements	Pages: 39 – 50
3	Valid and Invalid Arguments	Pages: 51 - 63
4	Predicates and Quantified Statements	Pages: 96 – 108
5	Direct Proof and Counter Example I Direct Proof and Counter Example III	Pages: 146-163 Pages: 170-179
6	Indirect Argument: Contradiction and Contraposition Indirect Argument: Two Classical Theorems	Pages: 198-207 Pages: 207-213
7	Mathematical Induction I Mathematical Induction II	Pages: 244-258 Pages: 258-268
8	Relations on Sets Reflexivity, Symmetry and Transitivity	Pages: 442-449 Pages: 449-459
9	**MID-TERM EXAM** Equivalence Relations Modular Arithmetic	Pages: 459-477 Pages: 478-498

10	Counting and Probability Possibility Tree and Multiplication Rule	Pages: 516-524 Pages: 525-539
11	Counting Elements of Disjoint Sets: The Addition Rule The Pigeonhole Principle	Pages: 540-553 Pages: 554-565
12	Counting subsets of a Set: Combinations The r-Combinations with Repetition Allowed	Pages:565- 584 Pages:584- 590
13	Pascal's Formula and the Binomial Theorem	Pages: 592-604
14	Graphs and Trees Trails, Paths and Circuits	Pages: 625-642 Pages: 642-660
15	Isomorphism of Graphs Trees	Pages: 675-683 Pages: 683-694
16	**FINAL EXAM (FROM THE WHOLE COURSE)**	