Ahmedabad University

Course	MAT101 Discrete Mathematics	Semester	Monsoon Semester 2024
Faculty Name(s)	Eshita Mazumdar	Contact	eshita.mazumdar@ahduni.edu.in
School	SEAS	Credits	3
GER Category:	Mathematical and Physical Sciences	Teaching Pedagogy Enable:NO	P/NP Course: Can not be taken as P/NP

Schedule

Section 1	11:00 am to 12:30 pm	Tue	30-09-24 to 01-12-24
	11:00 am to 12:30 pm	Tue	06-01-25 to 25-02-25
	11:00 am to 12:30 pm	Thu	30-09-24 to 01-12-24
	11:00 am to 12:30 pm	Thu	06-01-25 to 25-02-25

Prerequisite	Not Applicable OR Ideally the student should have passed class 12th with Mathematics, if that is not the case, MAT142 will provide sufficient foundations. In exceptional cases, a highly motivated student may take the course but will need to put 1 or two hours of extra work a day
Antirequisite	Not Applicable
Corequisite	Not Applicable
Course Description	This course provides introduction to the essential concepts of discrete mathematics that are necessary for practicing engineers and scientists and for higher level studies in computer science, mathematics and logic. Included topics are predicate calculus, methods of proofs, sets, counting, sequences, recurrence and graphs.

Course Objectives	The course aims to prepare students to work with algorithms, check their correctness and estimate runtime. It also aims to impart counting skills needed in basic applications of communication engineering.
Learning Outcomes	Students will be able to apply logical methods to problems at hand, use counting methods and work with graph algorithms.
Pedagogy	Regular classroom lectures
Expectation From Students	Students are expected to participate in course activities regularly.

Assessment/Evaluation	• Mid-Semester Examination:
	  ◦ midsemester exam - 20%
	  ◦ Quiz - 20%
	  ◦ assignment - 10%
	• End Semester Examination:
	  ◦ End semester exam - 20%
	  ◦ Quiz - 20%
	  ◦ assignment - 10%

Attendance Policy	As per Ahmedabad University Policy.
Project / Assignment Details	Two assignments of 10 marks each and four quizzes of 10 marks each will be given.

Course Material	Other Course Material • Link to video lectures by Prof. Kamala Krithivasan (https://nptel.ac.in/courses/106/106/106106094/) , • Link to video lectures by Prof. Kamala Krithivasan (https://nptel.ac.in/courses/106/106/106106094/) , • Link to video lectures by Prof. Kamala Krithivasan (https://nptel.ac.in/courses/106/106/106106094/) , • Link to video lectures by Prof. Kamala Krithivasan (https://nptel.ac.in/courses/106/106/106106094/) ,
Additional Information	All the examinations and quiz will be open book. The textbook may be used but any other printed or handwritten notes are not allowed. Calculators too are not allowed.

Session Plan

NO.	TOPIC TITLE	TOPIC & SUBTOPIC DETAILS	READINGS,CASES,ETC.	ACTIVITIES	IMPORTANT DATES
1	Introduction to propositions	propositions, compounding rules and truth tables	Rosen 1.1, 1.2	Logic gates and circuits.	
2	predicate logic	Predicates and quatifiers	Rosen 1.3, 1.4	Logic puzzles	
3	inference	Rules of inference	Rosen 1.6	Problem solving	
4	Problem solving session	Discussions of examples			
5	Proofs	Introduction to methods of proofs using examples	Rosen 1.7	direct and indirect proof examples	
6	Proofs	continuation of the previous class	Rosen 1.7	biconditional statements, errors in proofs	
7	Problem solving session	A summary of previous sessions		Problem solving	
8	Problem solving session	more practice with proofs			
9	Set theory	fundamenatals of set theory	Rosen 2.1, 2.2	Venn diagrams and D\\\'Morgan\\\'s rules	
10	functions	relations and functions	Rosen 2.3	Functions important in communication	
11	functions	Graphs of functions	Rosen 2.3	composit and inverse functions	

12	sequences	arithmatic and geometric progression and useful sequences	Rosen 2.5		
13	Revision and problem solving	Revision		Problem solving	
14	Summation	countability, diagonalisation, infinite sums	Rosen 2.6	use of countability arguments	
15	Algorithms	Introduction to algoritms with examples	Rosen 3.1	Discussion on the Halting problem	
16	Complexity	growth of algorithms, big O calculations	Rosen 3.2, 3.3	complexity calculation for algorithms	
17	Problem solving session				
18	recurrence relations	modeling with recurrence relations	Rosen 7.1	codeword ennumeration	
19	Recurrence relations	Problem solving	Rosen 7.1		
20	counting	product rule, the pigeon hole principle	Rosen 6.1,6.2	working with the inclusion exclusion principle	
21	permutations and combinations	basic properies and practice problems	Rosen 6.3		
22	Graphs	graphs and their representations	Rosen 9.1	social networks	
23	Special graphs	some important graphs, handshaking theorem	Rosen 9.2	fallacy detection	
24	traversal of graphs	Euler and hamiltonian paths	Rosen 9.5	Discussion on graph traversals and applications	
25	Problem solving session	Discussions and additional problems			

26	Problem solving session	Discussions and problems			
27	change of variables	Jacobian,Problem solving			
28	Tutorial				
29	Line integrals in plane	Vector integrals, conservative fields			
30	Gradient fields	Potential, Integral theorem for Gradients			
31	Gradient fields	Examples of gradient fields			
32	Tutorial				
33	Curvilinear coordinates	Spherical Polar coordinates, change of variables			
34	Curviliniar coordinates	Cylindrical Polar coordinates, change of variables			
35	Divergence and Curl	Definition, calculation in Cartezian coordinates			
36	Project Discussion				
37	Tutorial				
38	Tutorial				
39	Revision				
40	Project Submission				