BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI- HYDERABAD CAMPUS
FIRST SEMESTER 2020-2021
COURSE HANDOUT (PART-II)

17-08-2020

In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. **: MATH F421**
Course Title **: COMBINATORIAL MATHEMATICS**
Instructor-in-Charge **: Sabyasachi Dey**
Instructor **:** Sabyasachi Dey

1. Scope and Objective of the Course: Combinatorics is a fascinating but very broad subject. This makes it hard to classify, but a common theme is that it deals with structures that are, in some sense, finite or discrete. What sets combinatorics apart from other branches of mathematics is that it focuses on techniques rather than results. The way you prove a theorem is of bigger importance than the statement of the theorem itself. Combinatorics is also characterized by what seems to be less depth than other fields. Combinatorial reasoning underlies all analysis of computer systems. It plays a similar role in discrete operation research problems and in finite probability. It is very much useful in the analysis of the speed and logical structure of operations research algorithms to optimize efficient manufacturing or garbage collections.

2. Textbooks:

Richard A. Brualdi, Introductory Combinatorics, Pearson Prentice Hall, 2014.

3. Reference books

R1. Alan Tucker, Applied Combinatorics, John Wiley & Sons, 6th Edition, 2012.
R2. V. Krsihnamurthy, Combinatorics Theory and Applications, East-West Press Pvt. Ltd. 1985.

4. Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-7	Learning Advanced Permmutation and Combinations	Permmutations of and combinations of Multiset, Generating Permutations , Generating Combinations, Inversion in Permutation, Generating r-subsets	Sec:2.2, 2.3, 2.4,2.5,4.1,4.2,4.3, 4.4
8-13	To understand different counting principles	Catalan numbers, Difference sequence, Sterling numbers, mobius function and Inversion	Sec. 8.1, 8.2, 6.6
14-20	To learn theory of partitions	Partition Numbers, Lattice Paths, Schroder Numbers	Sec 8.3, 8.4, 8.5
21-23	Learning Ramsey Theorem	Pigeon hole principle, Stronger form, Ramsey Theorem	Sec. 3.1, 3.2, 3.3, 3.4
24-30	To learn Permutation Group and Polya's Counting	Permutation and Symmetry Groups, Burnside's Theorem, Polya's counting formula	Sec. 14.1,14.2, 14.3, 14.4
31-36	Introducing Graph Theory	Eulerian trails, Hamiltonian Paths and cycles, Bipartite graphs, trees	Sec 11.1, 11.2, 11.3, 11.4, 11.5
37-42	Enumeration problems on graph theory	Chromatic number, Matching Number, Independence Number, Clique Number	12.1, 12.4, 12.5

5. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Test 1	30 Minutes	15	September 10 – September 20 (During scheduled class hour)	Open Book
Test 2	30 Minutes	15	October 09 –October 20 (During scheduled class hour)	Open Book
Test 3	30 Minutes	15	November 10 – November 20 (During scheduled class hour)	Open Book
Assignments		25		Open Book
Comprehensive Exam	2 Hrs	30	TBA	Open Book

6. Chamber consultation Hour: To be announced in the class.

7. Notice: Notice, if any, concerning this course will be displayed only in CMS.

8. Make up: Prior permission is needed for make up; make up will only be given if enough evidence is there for not being able to take regular test.

9. **Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructor-in-charge
MATH F421