3. SYLLABUS COVERED BY EACH SPEAKER (TOPICS & MAIN RESULTS)

Prof. Geetha Venkataraman

1. Symmetry and patterns – Strip pattern, Frieze pattern, Wallpaper pattern.
2. Symmetry in Art – Escher's work.
3. Intuitive and Mathematical definition of Symmetry.
4. Types of symmetries in finite plane figures.
5. The symmetries of a finite plane figure, either consist of rotations only or an equal number of rotations and reflections.
6. Symmetry groups of finite plane figures: For any finite plane figure X, if Sym(X) is finite, then it is either D_n or $\mathbb{Z}_n$, for some n.
7. Sym(X) is a subgroup of S_X(the group of permutations on X).
8. Structure of finite dihedral group D_n and infinite dihedral group D_∞.
9. Definition of a Rigid Motion (Isometry).
10. Types of symmetries – Rotations, Reflections, Translations, Glide reflections.
11. Orthogonal linear transformations.
12. Any motion T on $\mathbb{R}^n$ such that T(0) = 0 is a linear transformation and hence orthogonal.
13. Every motion T on $\mathbb{R}^n$ is the composite of a translation and an orthogonal linear transformation.
14. If $E_2 = M(2,\mathbb{R}) = Sym(\mathbb{R}^2)$ and G is a subgroup of E_2 with no nontrivial translation, then G fixes a point in $\mathbb{R}^2$.
15. If G is a finite subgroup of E_2, then G is either cyclic or G is isomorphic to D_n for some n.
16. Group actions on a set X.
17. If G acts on a set X, then it induces a homomorphism from G to S_X.
18. Definitions of Orbit and Stabilizer of an element x in X (If G acts on X).
19. Orbit Stabilizer Theorem.
20. The Burnside's lemma.
21. There exist 5 distinct Platonic Solids – Tetrahedron, Cube, Octahedron, Dodecahedron, Icosahedron.
22. Symmetry and symmetry groups of Platonic Solids.
23. Verifying Euler's formula.