The topics we covered in this course were:


2. Review of Probability Theory: probability spaces, random variables, distribution and density functions, independence, expectation, variance, moments for random variables, characteristic functions, joint distribution and density functions, convergence of random variables, the Law of Large Numbers and the Central Limit Theorem, examples of random variables: discrete (Bernoulli, Binomial, Poisson) and continuous (Uniform, Exponential, Normal, Gamma, Chi Squared, Chi, $\Theta_\nu$, Tracy-Widom)

3. Classical Examples of Random Matrices: IID Random Matrix Ensembles (Bernoulli, real Gaussian, complex Gaussian), symmetric Wigner (symetric Bernoulli, GOE), Hermitian Wigner (GUE).


5. Invariance Properties of GOE and GUE.

6. The Gaussian Beta Ensemble, its matrix representation and the formula for its joint eigenvalue density.

7. The Airy function and the Tracy-Widom distribution.

8. The local distribution of eigenvalues (bulk scaling limit) for Gaussian Beta Ensembles.

9. The Hermite polynomials and the $k$-point correlation function for GUE.

10. The circular Beta ensemble and its matrix representation.