1.	Title of the course	Statistical Analysis of Network
2.	Course number	MA628L
3.	Structure of credits	3-0-0-3
4.	Offered to	PG
5.	New course/modification to	Modification To MA6039/16
6.	To be offered by	Department of Mathematics and Statistics
7.	To take effect from	July 2022
8.	Prerequisite	CoT
9.	**Course Objective(s):** To introduce statistical techniques required for network data problems arising from multiple domains. To develop methodologies connecting graph theory, random matrix, stochastic processes, non-parametric statistics. To apply the methods for practical modeling.	
10.	**Course Content:** Network data, network graph, representation and visualization, mapping dynamic network; Network graph characteristics: degree, centrality, local density, connectivity, graph partitioning, assortativity, mixing; Sampling and estimation: subgraph sampling, estimation of vertex total, total on vertex pairs, total on higher order, network group estimation; Models: random graph, small world, network growth, exponential random graph; Scoring methods, Gaussian graphical model network, inference on the tree, hierarchical clustering moment-based method; Model prediction for process on network graph: nearest neighbor, Markov random field, kernel-based regression, dynamic process; Network flow data analysis, traffic matrix estimation, direct and indirect graphical models.	
11.	**Textbook(s):** 1. Kolaczyk E D, *Statistical Analysis of Network Data: Methods and Models*, 1st Edition, Springer (2009). 2. Newman M E J, *Networks: An Introduction*, 1st Edition, Oxford University Press (2010).	
12.	**Reference(s):** 1. Kolaczyk E D and Csardi G, *Statistical Analysis of Network Data by R*, 2nd Edition, Springer (2020). 2. Koller D and Friedman N, *Probabilistic Graphical Models: Principles and Techniques*, 1st Edition, MIT Press (2009). 3. Sucar L E, *Probabilistic Graphical Models: Principles and Applications*, 1st Edition, Springer (2015).	