

## MCA 318: Social Network Analysis

<b>Teaching Scheme</b> Lectures: 3 hrs/Week Tutorials: 1 hr/Week  Credits: 4	<b>Examination Scheme</b> Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks
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**Prerequisites:** Graph theory, programming skills, artificial intelligence

**Course Objectives:**

1. This course covers data analysis on social networks, focusing on ways to handle large-scale networks efficiently.
2. It provides the main theoretical results in social network mining

**Detailed Syllabus:**

**Unit-1**

**Introduction to Social Network Mining:** Introduction to social network mining. Illustration of various social network mining tasks with real-world examples. Data characteristics unique to these settings and potential biases due to them.

**Unit-2**

**Graph Models and Node Metrics:** Social Networks as Graphs, Random graph models/ graph generators (Erdős-Rényi, power law, preferential attachment, small world, stochastic block models, kronecker graphs), degree distributions. Models of evolving networks, Node based metrics, ranking algorithms (Pagerank), Gephi graph visualization and exploration software

**Unit-3**

**Social-Network Graph Analysis:** Social network exploration/ processing: graph kernels, graph classification, clustering of social-network graphs, centrality measures, community detection and mining, degeneracy (outlier detection and centrality), partitioning of graphs, finding overlapping communities, similarity between graph nodes, counting triangles in graphs, neighborhood properties of graphs

**Unit-4**

**Information Diffusion in Social Networks:** Strategic network formation: game theoretic models for network creation/ user behavior in social networks, Information diffusion in graphs: Cascading behavior, spreading, epidemics, heterogeneous social network mining, influence maximization, outbreak detection.

**Unit-5**

**Event Detection** Classification of Text Streams, Event Detection and Tracking: Bag of Words, Temporal, location, ontology-based algorithms. Evolution Analysis in Text Streams, Sentiment analysis.

**Unit-6**

**Social Influence Analysis** Influence measures, Social Similarity - Measuring Influence, Influencing actions and interactions. Influence maximization.

**Text and Reference Books**

1. M.E.J. Newman: Networks: An Introduction, OUP, 2012
2. Network Data Analytics, Ed. Charu C. Aggarwal, Springer, 2011
3. David Easley and Jon Kleinberg, Networks, crowds, and markets, Cambridge University Press, 2010.
4. Jure Leskovec, Anand Rajaraman and Jeffrey David Ullman, Mining of massive datasets, Cambridge University Press, 2014.

**Course Outcomes:**

After completing the course, students will be able to:

1. understand the basic concepts of social networks
2. understand the fundamental concepts in analyzing the large-scale data that are derived from social networks
3. implement mining algorithms for social networks
4. perform mining on large social networks and illustrate the results.