University of Tehran
School of Electrical and Computer Engineering

Course:	**8101000 – Social Topics - Social Networks**		
Course type:	Elective	CE	Credit: 3
Level:	Graduate		
Co-requisite(s):			
Prerequisite(s):	Design and analysis of algorithms		
Prerequisite by topic:	Graph Theory, Discrete Math		
Textbook(s):	[1] Easley, Kleinberg, Networks, Crowds, and Markets Reasoning about a Highly Connected World, 2010 [2] Barabasi, Linked the new science of networks, 2002 [3] S. Wasserman and K. Faust, Social Network Analysis, 1994		
Coordinator:	Dr Aasadpour		
Goals:	To introduce the basics of Social Network Analysis and its application to solve computational problems in Social and Economical sciences and IT.		
Outcome:	Upon successful completion of the course, students will be able 1. to understand random graph models 2. to generate random graphs with different properties 3. To specify topology of random graphs 4. To understand centrality measures and compile their own measures for different applications. 5. To interpret centrality measures 6. To find communities with different algorithms 7. To analyze the complexity of algorithms for real social networks 8. To simplify graph algorithms for large scale graphs 9. To visualize graphs in best way 10. To understand how media and other things diffuse in social networks		
Topics:	1. Random graphs, power law, small-world property, scale-free networks, and generative processes 2. Networks and measurements: centrality indices, degree, closeness, betweenness, eccentricity, centroid, efficiency, reach, radiality, vitality measures, vulnerability, power centrality, eigenvector centrality, flow centrality, random walk centralities, HITS, PageRank, … 3. Structural balance, transitivity, cluster ability, motifs, dyadic and triadic relations, strength f weak ties		

	4. Affiliation Networks: Homphily, social influence, Social-affiliation networks, focal closure, membership closure, triadic closure, schelling model 5. Communities and cohesive subgroups, clique, n-cliques, k-plexes, k-cores, n-clan, n-club, lambda sets, LS-sets, Hierarchical clustering, Divisive and Agglomerative clustering, block models and matrix permutation clustering, Girvan – Newman's method, Modularity optimization, Louvain's method, Bio-inspired graph partitioning 6. Diffusion of Information, Failures and Epidemics in networks, SIR and SIS models, Rumor spreading, Opinion formation, Sznajd model, Deffuant model, Krause-Hegselman model, Local Interaction games, Linear Threshold Model, Independent Cascade Model, Voter model, K-Most Influential Person Problem 7. Advanced Topics: Link prediction, Community tracking, Graph Sampling, Structural equivalence, positions, roles, and block models
Computer usage:	- Implementing the projects using different programming lang. and packages. - Using available software and toolboxes for Social Network Analysis, Data Mining and Graph Visualization
Assignments:	- 3 to 4 homework covering different topics
Projects:	- Final Project
Grading:	Assignments: 20% Final Project: 40% Final exam: 40%
Further readings:	[1] P.J. Carrington, J. Scott, S. Wasserman, models and methods in social network analysis, 2005 [2] Hanneman, Introduction To Social Networks Methods, 2005 [3] J. Scott, Social Network Analysis: A Handbook, 2000 [4] A. Degenne and M. Forse, Introducing Social Networks, 1999 [5] Books on Graph Theory, Random Graphs [6] Boccaletti et al, "Complex networks Structure and Dynamics," 2006 [7] Newman, "The structure and function of complex networks," 2003 [8] Costa et al, "Characterization of complex networks A survey of measurements," 2008 [9] Fortunato, Community detection in graphs, 2010 [10] Arenas et al, "synchronization in complex networks," 2008
Prepared by:	Dr Asadpour
Date:	October, 27, 2012

*EE: Electrical Engineering CE: Computer Engineering IT: Information Technology