Module Code	TGI_M03
Module Title	Network Dynamics
Host Institution/ Contact	NUI Maynooth, Oliver Mason
Pre-requisites	
ECTS	5
Chief Examiner	Dr. Moez Draief Imperial College London
Teaching Staff	
Delivery	24 hours of lectures over a two week period. February 20-28, 2014
Aims	To introduce students to models of networks that arise in real-world settings. In particular, we will explore mathematical models and techniques to study such networks as well as natural dynamics that arise on them.
Syllabus	INTRODUCTION Examples of known networks and their statistics : degree, distance, diameter, local clustering, matrix representations (incidence, adjacency, Laplacian etc.) STRUCTURE Erdos-Renyi: branching analogy Small word Preferential Attachment Geometric Graphs Planted Partition/Stochastic Block model and Spectral Clustering Models of Dynamic Graphs

	DYNAMICS Random Walks Pagerank, Hubs and Authorities Random walk as an algorithm: cover time, node counting, clustering ER-graph and other graphs: spectral radius of adjacency SIS model Innovation spread Rumour model Averaging Voter model Consensus dynamics Other dynamics: Moran process, evolutionary dynamics and games on graphs ALGORITHMS Optimal seed selection Immunisation Graph clustering Rumour-source identification Games on graphs and finding Nash equilibria
Assessment	Assessment: one 2-hour examination
Bibliography	