Factors in graphs, weighted graphs and directed graphs.

A factor is a subgraph that contains all of the vertices of its host graph. For instance, a perfect matching is a factor consisting entirely of disjoint edges and a Hamiltonian cycle is a factor that is a cycle. Many celebrated theorems in graph theory give sufficient conditions for the existence of a specific factor. For example, Dirac’s Theorem states that if $G$ is a graph on $n$ vertices, $n \geq 3$ and the minimum degree of $G$ is at least $n/2$, then $G$ contains a Hamiltonian cycle.

In this talk, we will describe several related theorems for graphs, directed graphs and weighted graphs. For example, we will discuss the following recent result: For every $\varepsilon > 0$ there exists $\gamma > 0$ such that if $G$ is a graph on $n$ vertices, the minimum degree of $G$ is at least $(1/2 + \varepsilon)n$ and the independence number of $G$ is at most $\gamma n$, then $G$ has $n/3$ vertex disjoint copies of $K_3$ when $n$ is sufficiently large and divisible by 3. (Received September 22, 2015)