Title: Mathematical Programming for some logistics problems of a regional airline carrier

Abstract:

This seminar will show mathematical models and algorithms for optimizing the management of crews and aircrafts of an airline company operating flights in Canary Islands. It is the result of a research work for a company, and it can be extended to be applied to other transportation companies with similar characteristics. The seminar will concern with the daily planning and the crew rostering problems, although our research has also considered more complicated issues like management disruption.

The main part of the seminar will introduce, model and solve a new vehicle routing problem arising when planning the sequence of legs that each crew and aircraft of an airline company must perform. It was motivated by a real-world problem in Canary Island, where the airline operates flights between 11 airports. There are no flight during the night, there are about 180 flights (legs) during a day, and the flying time between two airports is around 30 minutes. The crews of the airline company live in the two major islands (Tenerife and Gran Canaria). The airport of Gran Canaria concentrates all the equipment to perform the maintenance of the aircrafts, which must be performed immediately after two operating days. Thus, an aircraft starting the journey outside Gran Canaria must finish in Gran Canaria. Instead, each crew is expected to return to the island where it started that day. There is no limitation on the number of legs that an aircraft can fly in a day, but the number of legs assigned to a crew in a day is limited by law. There is also a limitation in the activity time of each crew in a day. The aim of the problem is to find a sequence of legs to each crew and each aircraft minimizing a cost function while satisfying the above constraints. The above problem can be seen as a routing problem with two depots, where one must find routes for two type of vehicles (crews and aircrafts). We give a mathematical formulation of the whole routing problem and a branch-and-cut algorithm to solve it. Note that it integrates the assignment, aircraft routing and crew schedulling. We will also discuss the crew and aircraft rostering. The performances of our implementation is evaluated and discussed on real-world instances.

This seminar will show results that have been published in two articles: One published in the journal OMEGA (doi:10.1016/j.omega.2013.06.006) and another one in press in the journal TRANSPORTATION SCIENCE.

This seminar will also give us the opportunity of showing the geography of Canary Islands, and distributing some information regarding the studies of Mathematics at University of La Laguna. We hope to motivate students and staff to our faculty in Tenerife within our Erasmus+ agreement.