# Course G1503: UNCERTAINTY ANALYSIS IN ENGINEERING

## GENERAL INFORMATION

Spring Semester
6 ECTS credits

## INSTRUCTOR(S)

ALBERTO LUCEÑO VÁZQUEZ. Catedrático de Universidad. DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION (alberto.luceno@unican.es)

## Description

The course provides an introduction to probability and statistics, statistical techniques, and uncertainty analysis with examples drawn from civil, environmental, industrial and related engineering disciplines. Specific topics include: data presentation, discrete probability theory, commonly used probability distributions (normal, lognormal, gamma, Weibull, Gumbel, Poisson, binomial, geometric), probability plotting papers, survey sampling & experimental design issues, parameter estimation (MLEs and moments), confidence intervals, hypothesis testing (Student t; one/two-sample/paired), some nonparametric statistical tests, simple linear regression and an introduction to multiple linear regression and model selection.

## TEXTBOOK

Probability and Statistics for Engineering and the Sciences. Jay L. Devore.

## SYLLABUS

1. UNCERTAINTY ANALYSIS FOR SAMPLES.
   a. Population & sample; Univariate Data
   b. Bivariate Data; joint frequency distribution

2. UNCERTAINTY ANALYSIS FOR POPULATIONS.
   a. Elements of probability
   b. Discrete random variables
   c. Continuous random variables
   d. Lognormal dist. (structural reliability)
   e. Joint and conditional distributions
   f. Distribution of sample mean
   g. Sampling & Simulation
   h. Bias, variance, mean squared error
   i. Confidence intervals (CIs) & sampling dist
   j. Another look at CIs: Hypothesis testing
   k. P-values, Choice of hypothesis
   l. Sign, Wilcoxon sign rank, rank-sum tests
   m. Regression