NUMERICAL ANALYSIS

Prof. Q LOUVEAUX

<u>Work load:</u> 20h Theory (lectures),10h Practice (lab), 20h Project work.
<u>Number of credits:</u> 5 ECTS
<u>Course code:</u> MATH0006-3
<u>Source:</u> http://www.emerald.ulg.ac.be/?q=numerical-analysis

► *Course contents:*

Numerical analysis is at the boundary between Mathematics and Computer Science. It consists in studying how to practically obtain in a computer different mathematical concepts studied in other courses.

There are two main types of problems studied by numerical analysis: how to actually compute results for which an analytical expression exists but that can be obtained more or less accurately depending on the selected method; how to compute solutions of real problems for which no analytical solution is known but that can be approximated using a computer.

The course is structured in four main chapters:

Ch 1: Polynomial interpolation and regression

Ch 2: Numerical linear algebra and basic linear programming

Ch 3: Nonlinear systems and some basics about non linear optimization

► *Intended Learning Outcomes:*

At the end of the course, the student will have to

- master the main numerical methods used to solve linear and nonlinear systems, compute eigenvalues, regressions,
- understand the bases of linear optimization and the simplex algorithm,
- be able to analyze the behavior of these numerical methods and in particular to be able to discuss their stability, their order of convergence and their conditions of application,
- be able to apply these methods to academic and simple practical instances

► *Prerequisites and co-requisites:*

An introductory course on linear algebra and calculus.

► *Planned learning activities and teaching methods:*

The course is organized as follows: 10 lectures, 5 tutorials and a small programming assignment.

► *Recommended or required readings:*

The syllabus is available at the CdC.

► *Assessment methods and criteria:*

A written exam accounts for 75% of the grade (theory + exercises). The programming project accounts for 25% of the grade. The assessment method is competence based.
This course links with data processing and analysis as used in the geostatistics course.

► *Contribution to EIT's Overarching Learning Outcomes:*

The course works on Research skills (EIT OLO 5) as it shows how to analyze a computational method and clarifies the important questions to raise when faced with numerics.