Biologically Inspired Computing (Biocomputing) is an exciting and relatively recent field in which ideas and principles from biology are used to design and implement new and improved computing methods. Many of these Biocomputing techniques can be, and have been used successfully to find good solutions to difficult problems in a wide range of areas such as combinatorial optimization, classification and decision making, pattern recognition, machine learning, non-linear dynamics (modeling), computer security, biometrics, time series prediction, data mining, image processing, and many more. In short, Biocomputing provides a powerful set of techniques that can be used for optimization, problem solving, and modeling in many diverse areas, not only in science, but also in business and R&D.

This short course provides a general (and gentle) introduction to Biologically Inspired Computing. First, an overview of the field is given, including some examples of its methods and how they are inspired by the ways in which biological (“complex”) systems perform computations, process information, and make decisions. Next, the topics of search and optimization, and limitations to “traditional” (exact) computing methods are addressed. This provides the right context and motivation for why we are interested in new and improved computing techniques at all. Four Biocomputing methods will then be presented in more detail:

- Evolutionary Computation,
- Neural Networks,
- Cellular Automata, and
- Computer Immune Systems.

Many examples of different application areas are also included throughout the lectures. The course will finish with a short practical session, to allow the participants to play around with some simple examples and get a better intuitive understanding of the presented techniques and how they work and can be used.

The course is specifically set up to be accessible and understandable for an audience with a wide variety of backgrounds. All lectures are at a general and introductory level, avoiding mathematical and technical details as much as possible, focusing instead on explaining the basic concepts and (biological) ideas behind the methods, using many (visual) examples. It is based on more than 10 years of personal experience in working with, studying, and teaching several of these techniques, and is meant to be an introduction to make participants aware of and familiar with Biologically Inspired Computing, as a first step towards actually using these techniques.
Course schedule

The course consists of a series of lectures (1 to 1.5hrs each), most of which can be presented separately and independently, or as a complete course over the duration of 2 days. The schedule for the full course (12hrs total) is given below, but it can be shortened or adjusted according to specific needs or desires.

Day 1
- **Morning**
  - Biologically Inspired Computing Intro
  - Search & Optimization
- **Afternoon**
  - Evolutionary Computation
  - Neural Networks

Day 2
- **Morning**
  - Cellular Automata
  - Computer Immune Systems
- **Afternoon**
  - Biocomputing Examples
  - Practical

Further information

Information about this and other courses and lectures can be found online at:
www.WorldWideWanderings.net/Lectures.html

Please don't hesitate to contact me directly for any further information, or if you wish to have this course presented at your institution or company.

Wim Hordijk, PhD
wim@WorldWideWanderings.net