

**VIVANT, INFORMATION ET SYSTÈME****LIFE, INFORMATION AND SYSTEM****Lecturers:** Julien HULLERY, Bénédicte LAFAY, Gérard SCORLETTI

| Lecturers : 12.0 | TC : 16.0 | PW : 0.0 | Autonomy : 4.0 | Study : 0.0 | Project : 0.0 | Language : MI

Objectives

Insights on life, its forms, structure and organization, functioning and changing, are indispensable to the comprehending of the world that we are part of and on which we rely. It is nowadays understood that the behavior of a living organism as a whole cannot be explained by its constituents alone and that many properties of life arise at the system level only. As well, the notion of information is at the heart of the mechanisms of adaptation, reproduction and evolution of living forms. The aim of this course is to introduce the engineer students to the relevance and contribution of system and information theories to the deciphering of life organization and processes.

Keywords : Life, DNA, RNA, Replication, Transcription, Evolution, Adaptation, Emergence, Genetic information, Information theory, Information coding, Information transmission, Systems, Feedback, Regulation, Networks, Interconnections

Programme

- I – Life
 - a) Life as a process
 - b) Fundamentals of biological information
- II – Information
 - a) Information theory and biology
 - b) Interactions and information networks
- III - Systems
 - a) Dynamic models for living systems
 - b) Feedback

Learning outcomes

- To know some key aspects about the Living
- To identify the current issues related to the study of living organisms
- To adopt a systemic point of view when analyzing the behavior of living organisms (inverse engineering)
- To understand the issues regarding the coding and the transmission of genetic information

Independent study

Objectifs : Scientific literature related to the three aspects of the course will be analyzed

Méthodes : Each group composed of 7 to 8 students study a different article. A written summary that must report the scientific approach of the paper is asked. An oral presentation to the whole class is finally given.

Core texts

Bertalanffy, L. v. , *GENERAL SYSTEM THEORY, FOUNDATIONS, DEVELOPMENT, APPLICATIONS*, George Braziller, New York., 1968
Shannon, C.E. *A MATHEMATICAL THEORY OF COMMUNICATION*, Bell System Technical Journal, 1948
Wiener, N. *CYBERNETICS OR CONTROL AND COMMUNICATION IN THE ANIMAL AND THE MACHINE*, MIT Press, 1948

Assessment

Final mark = 30% knowledge + 70% know-how
Knowledge = 100% final exam
Know-how = 100% continuous assessment