

MATH0082 (Evolutionary Games and Population Genetics)

Year: 2018–2019
Code: MATH0082
Level: Masters
Value: 15 UCL credits (= 7.5 ECTS credits)
Term: 2
Structure: 3 hour lectures per week
Assessment: 100% examination
Lecturer: Dr SA Baigent

Course Description and Objectives

The course aims (i) to present the fundamentals of Mathematical Population Genetics, which gives mathematical expression to the genetic aspects of evolution in natural populations, and (ii) to present some of the ideas from Evolutionary Game Theory that have recently been used to illuminate the evolution of various properties and behaviours of animals. The course introduces a wide range of new mathematical models which include both continuous and discrete-time systems. The generality of the key models enables us to prove a range of theorems that yield important and fundamental results in both mathematical genetics and game theory.

This course is independent of the course MATH0030.

The course might also be of interest to some students from other departments.

Detailed Syllabus

The topics to be discussed will be chosen from:

- (i) Mathematical description of Mendelian genetics. The Hardy-Weinberg law. Natural selection on gene frequencies (discrete and continuous-time models). Fisher's Fundamental Theorem. Dominance, fixation-time and heterozygote advantage. Mutation-selection balance. Recombination.
- (ii) Evolutionary Game Theory. Fitness pay-offs. Evolutionarily-stable strategies. Nash equilibria. Evolutionary dynamics and learning. Hawk-Dove games. Paper-Scissors-Stone game. Asymmetric games. The battle of the sexes.