

Evolution, Ecology and Game Theory

86-546-01

Lecturer: Prof. David Kessler

Course type: Lecture

Year: 2018-2019

Semester: A

Number of Hours: 3

A. Class Objectives:

To provide a basic introduction to three major sub-fields in the dynamics of populations: Evolution, Ecology and Game Theory and in the connections between them.

B. Details of subjects to be covered:

1. Basic Evolutionary Theory

- (a) Fitness and Landscapes, Mutations
- (b) Moran and Wright-Fisher Models
- (c) Stochastic Modelling - The Master Equation, Fokker-Planck Equation and Gillespie Algorithm
- (d) Neutral Molecular Evolution and Genetic Drift
- (e) The Small Mutation Limit and Clonal Interference
- (f) Coalescence Theory

2. Basic Ecological Theory

- (a) Neutral Theory
- (b) McArthur-Wilson Theory
- (c) Lotka-Volterra Systems and the May Limit
- (d) Niche Theory
- (e) Predator-Prey and Symbiosis
- (f) Food Webs
- (g) Spatial Ecology

3. Basic Game Theory

- (a) Payoffs and the Two-Player Game
- (b) Hawk-Dove and Prisoner's Dilemma
- (c) Hamilton-May Model
- (d) Adaptive Dynamics