Course goal: to provide students with the instruments for rationally managing animal and plant populations and ecosystems.

Topics
Species and populations threatened by extinction:
- The causes of extinction: review. Local extinction, global extinction, extinction in the wild.

Populations in spatially explicit landscapes:
- The importance of space in ecology. Habitat loss and fragmentation as important mechanisms of extinction. The problem of alien species invasion.
- Dispersal in animals and plants. Diffusion as a way to describe dispersal. Diffusion equation in limited and unlimited habitat. Adding demography to diffusion: the reaction-diffusion equation. Speed of colonization and invasion. Critical reserve dimension.

Interspecific competition:
- Gause's and De Wit's experiments. Volterra's model of competition for one common resource. The principle of competitive exclusion.
- Interference and exploitative competition. Park's experiments. Volterra's model of interference competition.

Sustainability of biomass harvesting and its management:
- The overexploitation and depletion of biological renewable resources. Examples from forestry and fisheries. The tragedy of the commons. Open access and the consequences of not regulating the exploitation of renewable resources. Different management goals.
- The management of age-structured populations. The optimal rotation period in forest management. The effect of the discount rate. Fish populations with constant recruitment. The problem of optimal effort and mesh size. Beverton and Holt’s analysis. The eumetric mesh size and eumetric production curves. Bioeconomic considerations.

Parasite and disease ecology:
- Dynamics of diseases caused by microparasites. Various transmission mechanisms: direct, water and airborne, environmental, vertical. Susceptible, exposed, infected and recovered individuals. Incidence and prevalence. Diseases with permanent and temporary immunity. Si
and SIR models. The regulation of Malthusian populations. The basic reproduction number of a microparasitic disease. Vaccination and culling policies.

– Dynamics of diseases caused by macroparasites. Anderson and May's model for the dynamics of hosts and parasites. Distribution of parasite burden inside a host and the clumping parameter. The basic reproduction number of a macroparasitic disease.