

## MODELLING OF BIOLOGICAL SYSTEMS (BIOS02) 7.5 credits, AUTUMN 2011

**Dates:** 27 Oktober – 28 November

**Locality:** Lecture room "Raggmossan" in the Ecology Building, Sölvegatan 37, Lund

**Goals:** After the course you will know the basics of mathematical topics that are important in biology such as: optimisation, linear algebra, dynamical systems, game theory, dynamic modelling. You will also be introduced to programming and basic computational intelligence (CI) methods

**Literature:** Compendia that are handed out during the course

**Examination:** Each hand in assignment that the teacher approves of will give you a bonus for the examination test. "Godkänd" = "Approved" is given for 60% correct answers, "Väl godkänd" for 80%. The exercises should be handed in to the responsible teacher at the end of each section of the course.

**Exercises:** Are individual and may give you up to 24% (in total) bonus to add to the examination test. Each exercise can give 6 or 8% addition.

**Photo copying:** Copies for the course can be made in the copying room at the ground floor. A copying card is available next to the machines. Code is available from AB.

### Teachers

AB: Anders Brodin, teacher in charge, Evolutionary Ecology, Phone 2224143, email: [Anders.Brodin@teorekol.lu.se](mailto:Anders.Brodin@teorekol.lu.se).

MP: Mikael Pontarp, Evolutionary Ecology, [Florian.Muijres@teorekol.lu.se](mailto:Florian.Muijres@teorekol.lu.se)

JR: Jörgen Ripa, Evolutionary Ecology, [Jorgen.Ripa@teorekol.lu.se](mailto:Jorgen.Ripa@teorekol.lu.se)

L = lecture, E = exercise, Daily course time is 10.00 - 16.00

Course schedule:

<i>Time</i>	<i>Topic</i>	<i>Teacher</i>
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### I. Programming for biologists:

#### **Week 43:**

Thursday 27/10

10:00 - 11:00 Introduction to modelling (AB)

11:00 – 12:00 Programming in VB (L) AB

13:00 – 16:00 Programming in VB (E)

Friday 28/10

10:00 - 12:00 Programming in VB (L+E) AB

13:00 - 16:00 Programming in MATLAB (E)

#### **Week 44:**

Monday 31/10

10:00 - 17:00 Own programming exercise

Tuesday 1/11  
10:00 - 12:00 Own programming exercise  
15:00 Hand in programming exercises to Anders

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## **II. Mathematics for biologists**

Wednesday 2/11

10:00 – 12:00 Mathematics for biologists (L) MP  
13:00 – 16:00 Mathematics for biologists (L + E) MP

Thursday 3/11

10:00 – 12:00 Mathematics for biologists I (L) MP  
13:00 – 16:00 Mathematics for biologists (E)

Friday 4/11

10:00 – 12:00 Mathematics for biologists II (L) MP  
13:00 – 16:00 Mathematics for biologists II (E)

### ***Week 45:***

Monday 7/11

10:00 - 16:00 Own mathematics exercises

Tuesday 8/11

10:00 – 12:00 Own mathematics exercises  
15:00 Hand in math exercises to Mikael

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## **III. Theoretical ecology methods**

Wednesday 9/11

10:00 – 11:00 What is theoretical ecology? (L) AB  
11:00 – 12:00 Optimal foraging (L) AB  
13:00 – 16:00 Optimal foraging (E) (MP)

Thursday 10/11

10:00 – 12:00 Game theory (L) JR  
13:00 – 16:00 Game theory (E) (MP)

Friday 11/11

10:00 - 12:00 Linear algebra in demography (L) JR  
13:00 - 15:00 Linear algebra in demography (E) JR

### ***Week 46:***

Monday 14/11

10:00 – 12:00 Dynamic systems (L) JR  
13:00 - 16:00 Dynamic Systems (E)

Tuesday 15/11

10:00 – 12:00 Stochastic modelling (L+E) JR  
13:00 – 15:00 Stochastic modelling (E) JR

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## **V. Biology in mathematics**

Wednesday 16/11

10:00 – 11:00 Biology methods used in mathematics (E) AB

11:00 - 12:00 Genetic algorithms (L) AB

13.00 – 16:00 Genetic algorithm exercise (AB)

Thursday 17/11

10:00 - 12:00 Artificial neural networks (L) AB

13:00 - 16:00 Neural networks (E) AB

Friday 18/11

10:00 - 12:00 Start of own modelling task AB

13:00 - 16:00 Own modelling task

**Week 47:**

Monday 21/11

10:00 – 16:00 Own modelling task

Tuesday 22/11

10:00 – 16:00 Own modelling task

Wednesday 23/11

10:00 - 12:00 Own modelling task

13:00 – 14:00 Questions to teachers

15:00 Hand in modelling assignment to responsible teacher (AB, JR, CJ)

Thursday 24/11 Exam studies

Friday 25/11

09:15 - 13:00 Examination test (AB)