**Applied population dynamics**  
2 credits - 16:712:598  
Spring 2011

**Instructor:** Olaf Jensen (303A IMCS building) – ojensen@marine.rutgers.edu

**Pre-requisites:** (1) graduate student status (junior or senior undergraduates by permission of instructor); (2) introductory statistics; (3) some (limited) programming experience (any of the following: R, Matlab, C, Visual Basic, etc.); (4) basic population biology; (5) access to a laptop with Microsoft Excel and R installed (can be downloaded for free from: [http://www.r-project.org/](http://www.r-project.org/))

**Summary:** Mathematical models of population dynamics (changes in population size or biomass over time) are used in many branches of ecology. In this course, we will use readings from textbooks and journal articles as well as hands-on computer exercises to learn some of the most commonly used techniques for applying population models to data gathered in the field. We will draw heavily from the fisheries science literature, but will also use examples from wildlife ecology and management. Topics include: models of individual growth, biomass dynamic models, stock-recruitment relationships, delay-difference models, age-structured models, and analysis of mark-recapture data.

**Format:** One 2 hour meeting per week. Day and time TBD. Location will be either IMCS 203 or Lipman. Maximum enrollment: 10.

**Evaluation:** homework (50%), in class discussions (25%), final project (25%)

**Tentative Schedule**

*Week 1* – Introductions; assessment of basic probability and statistics knowledge; overview of course goals; principles for fitting models to data

*Week 2* – von Bertalanffy growth model I; concepts: likelihood profiles

*Week 3* – von Bertalanffy growth model II – alternative formulations; concepts: parameter confounding

*Week 4* – logistic population model I; concepts: process and observation error

*Week 5* – logistic population model II; concepts: contrast and information content of time series data

*Week 6* – stock-recruitment models I; concepts: compensation and depensation

*Week 7* – stock-recruitment models II; concepts: mixed-effects models and meta-analysis

*Week 8* – delay-difference models; concepts: the components of surplus production

*Week 9* – age-structured models I; concepts: maturity and fecundity schedules

*Week 10* – age-structured models II; concepts: the value of age-composition data

*Week 11* – methods for indirect estimation of natural mortality; concepts: life-history theory
Week 12 – analysis of mark-recapture data I – estimating survival

Week 13 – analysis of mark-recapture data II – estimating abundance

Week 14 – TBD based on student interests