**國立臺灣大學生命科學院 新開課程課程大綱**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ※課程名稱 | 中文 | 理論生態學導論 | | | |
| 英文 | Introduction to Theoretical Ecology | | | |
| ※開課學期 | 112-1 | | | | |
| ※開課系所 | 生態演化所 | | ※課號/課程識別碼 | EEB5096 | |
| ※學分(數) | 3 | | ※必/選修 | 選修 | |
| ※授課教師 | 柯柏如 | | | | |
| ※全/半年 | 半年 | | 英語授課 | | 是：■ 否：□ |
| 修課人數上限 | 14 | | 選課方式 | | □第1類 ■第2類 □第3類  （類別說明請參校網頁） |
| ※課程概述(至少50字) | The development of theory plays an important role in advancing ecology as a scientific field. This three-unit course is for students at the graduate or advanced undergraduate level. The course will cover classic theoretical topics in population and community ecology, staring from single-species dynamics and gradually build up to multispecies models. Emphasis will be on theoretical concepts and corresponding mathematical approaches. This course is designed as a two-hour lecture (written on black board) followed by a one-hour complementary hands-on practice module. In the lecture, we will analyze dynamical models and discuss their theoretical implications. In the practice section, we will use a combination interactive applications and numerical simulations to gain more intuition of the dynamics and behavior of different models. | | | | |
| ※課程目標 | By the end of the course, students are expected to be familiar with the basic building blocks of ecological models, and would be able to formulate and analyze simple models of their own. The hands-on practice component should allow students to link their ecological intuition with the underlying mathematical model, helping them to better understand the primary literature of theoretical ecology. | | | | |
| 課程要求  或  預修課程 | Students are only expected to have basic understanding of Ecology and calculus (e.g., freshman introductory course). It's OK if you're not familiar with calculus as we will provide relevant material for you to review during the first week. The final grade consists of: assignment problem sets (60%), midterm exam (15%), final exam (15%), and participation (10%). | | | | |
| 主要  參考書目 | We will use a combination of textbooks of theoretical ecology. Textbook chapters and additional reading materials (listed in the course outline) will be provided.   1. *A Primer of Ecology* (4th edition). Nicholas Gotelli, 2008. 2. *An Illustrative Guide to Theoretical Ecology*. Ted Case, 2000. 3. *A Biologist’s Guide to Mathematical Modeling in Ecology and Evolution*. Sarah Otto & Troy Day, 2011. 4. *Mathematical Ecology of Populations and Ecosystems*. John Pastor, 2008. 5. *Nonlinear Dynamics and Choas.* Steven Strogatz, 2000. | | | | |
| ※  課程進行方式與  週次單元主題 | 課程進行方式：  This course is designed as a two-hour lecture (written on black board) and a one-hour complementary hands-on practice module (analytical problem sets, interactive applications, and numerical simulations).  週次單元主題：   |  |  | | --- | --- | | 週次 | 單元主題 | | 第1週 | Introduction: what is theoretical ecology?  Grainger et al. (2022) An empiricist’s guide to using ecological theory. The American Naturalist, 199: 1-20 | | 第2週 | Exponential population growth  Gotelli [Ch.1], Case[Ch.1] | | 第3週 | Logistic population growth and stability analysis  Gotelli [Ch.2], Case[Ch.5], Otto & Day[Ch.5] | | 第4週 | Metapopulations and patch occupancy models  Gotelli [Ch.4], Case[Ch.16] | | 第5週 | Harvesting and bifurcation  Pastor [Ch. 7], Strogatz [Ch. 3] | | 第6週 | No class (National holiday) | | 第7週 | Age-structured population models  Gotelli [Ch.3], Case[Ch.3] | | 第8週 | Lotka-Volterra model of competition: graphical analysis  Gotelli [Ch.5], Case[Ch.14] | | 第9週 | **Midterm exam** | | 第10週 | Lotka-Volterra model of competition: invasion analysis and linear stability analysis  Otto & Day [Ch.8]  Broekman et al. (2019) Signs of stabilization and stable coexistence. Ecology Letters, 22: 1957-1975 | | 第11週 | Predator-prey interactions (I)  Gotelli [Ch.6], Case[Ch.12, 13] | | 第12週 | Predator-prey interactions (II) + Discussion on May (1972)  Gotelli [Ch.6], Case[Ch.12, 13]  May (1972). Will a large complex system be stable? Nature, 238: 413-414 | | 第13週 | Mechanistic models for consumer-resource dynamics  Tilman (1980) Resources: A graphical-mechanistic approach to competition and predation. The American Naturalist, 116: 162-193  Armstrong & McGehee (1980) Competitive exclusion. The American Naturalist, 115: 151-170. | | 第14週 | Multispecies models of predation: apparent competition  Holt (1977) Predation, apparent competition, and the structure of prey communities. Theoretical Population Biology, 12:197-229 | | 第15週 | Research applications: plant-soil feedback as an example | | 第16週 | **Final exam** | | | | | |
| 評量方式 | ■考試 (30%) ■作業 (60%) ■出席 (10%) □平時參與 □其他 | | | | |
| 備註 |  | | | | |