科目ナンバリング																			
授業科目 〈英訳〉	名	Ecological Sciences-E2 :Theory and Practice Applied to Nature and Society in Disturbed Ecosystems in an Integrative Framework Ecological Sciences-E2 :Theory and Practice Applied to Nature and Society in Disturbed Ecosystems in an Integrative Framework								担当者所属 職名・氏名			基礎物理学研究所 特別招へい教授 CHON , Tae-Soo						
群	統	合科学	学科目群	\$ 分野(分類) 環			環境	<sup>놀</sup>						使用言語 英語			語		
旧群			単位数	2単位		時間数	30	時間		授	業刑	形態 講義		<b>鳧(対面授業</b>		業科	《科目)		
開講年度・ 開講期	202 後	2025・ 後期集中		曜時限	集	中		配当学年		全回生			対象学生		理系向				
[授業の概要・目的]																			
As is well known, unprecedented economic and industrial developments have been achieved in our world, however resulting in severe pollution and environmental disturbance problems in ecosystems consequently. Ecology mainly deals with the totality of relationships among biological and abiological components in ecological systems to address abundance/distribution of populations/communities, and energy efficiency and																			

ecological systems to address abundance/distribution of populations/communities, and energy efficiency and biogeochemical cycling in ecosystems. The efforts to restore the damaged ecosystems have been greatly emphasized, striving to reestablish precious ecosystems through monitoring, conservation, and recovery. In this course the students will learn how effectively ecological sciences could be realized to achieve the goal of ecosystem safety, stability and sustainability in the sharply contrasting ecological situations, severe anthropogenic impacts versus serious efforts to restore damages. In addition to basice concepts in ecology, recent progress and future perspectives will be discussed with the focus on linking society and academic fields including interfacing ecological objects (e.g., individual animal, landscape), mobile sensor networks, eco-evolutionary processes, molecular ecology, and social collaborations. The course would provide 1) history and scope of ecology, 2) key concepts in ecology regarding abudance, distribution, bio-diversity, energy efficiency, and biogeochemical cycling at different hierarchical levels in life systmes (e.g., population, community, ecosystem), 3) ecology from functional/methodological aspects including different academic disciplines, and 4) realization of ecological principles in human societies.

### [到達目標]

During the course work, the students will have clear ideas on the following issues: 1) Definition of ecology and related concepts in linking nature and society, 2) Important issues at hierarchical levels of life systems including molecule/cell, individual, population, community and ecosystem, 3) Ecological methodologies in an integrative context including computational sciences (e.g., physics, mathematics, informatics), engineering (e.g., electrical, computer, environemental), and bioloy (e.g., behavior, genetics, evolution, physiology), and 4) Realization of ecological principles in human society.

## [授業計画と内容]

Conventinal and new approaches will be introduced in the class consisting of five Parts including ""I. History and scope of ecology", ""II. Abudance, distribution and bio-diversity at population/community level"", ""III. Survivability of ecological systems", ""IV. Ecology from functional aspect"", and ""V. Ecology from methodological aspect"", overall focusing on acheiving stability, safety, and sustainability in ecological systems in responding/adapting to natural and anthropogenic stressors/disturbances/disasters. Part I: History and scope of ecology

1. Introduction: Course guidance and historical backgrounds of ecological sciences

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2. Scope of ecological sciences: Definition of ecology, relation with other academic fields and theoretical/ practical disciplines

Part II: Abundance, distribution, bio-diversity at population/community level

3. Population regarding abundance

4. Population regarding distribution

5. Community regarding bio-diversity

6. Community regarding trophic structure, food web dynamics, and succession

Part III: Survibability of ecological systems

7. Ecosystem regarding energy efficiency

8. Ecosystem regarding biogeochemical cycle

9. Ecosystem regarding response/adapatation to disturbances

10. Realization of ecological principles in human societies

Part IV: Ecology from functional aspect

11. Behavior and physiology

12. Genetics and evolution

Part V: Ecology from methodological aspect

13. System concept and engineering

14. Physical and mathematical sciences

Part VI Evaluation and feedback

15. Final examination and learning achievement evaluation

16. Feedback (Students will be notified of feedback methods separately.)

#### [履修要件]

Basically a wide scope of academic fields including biological sciences and methodological fields including mathematics, physics, electrical/computer engineering would be dealt with in the course. However, the students are not required to have the prior knowledge. The main purpose is to introduce how the methodology could be effectively applyed to typical ecological events by using demonstrating programs. The essential knowledge for the class will be provided as needed in class. The level of knowledge in high school and/or freshman-sophmore in a wide scope would be fine for learning in the Class. The self-study, however, is encouraged for the students for understanding the topics given in the class in depth.

#### [成績評価の方法・観点]

Evaluation will be based on 1) written examination during the official examination term (50 points), 2) assignments (twice, 20 points each), and 3) class performance (10 points including attendance, participation, etc.)

\* Those who are absent more than four times will not be credited.

\* Students are expected to submit all assignments. The assignments with an originality will be given a high score.

#### [教科書]

E. P. Odum and G.W. Barrett <sup>©</sup>Fundamentals of ecology (5th ed.) 2005 <sup>[]</sup> (Thomson ) ISBN:0-534-42066-4

C. J. Krebs, Ecology: the experimental analysis of distribution and abundance. (6th Ed.). 2009. Pearson [参考書等]

# <u>(</u>参考書)

S. E. Jørgensen <sup>¶</sup> Integration of ecosystem theories: a pattern. 1992. <sup></sup> (Kluwer)

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1) J. A. Ludwig and J. F. Reynolds, 1988, Statistical ecology: a primer on methods and computing, John Wiley & Sons, 2) Handbook of ecological modelling and informatics (Eds., S.E. Jørgensen, T.-S. Chon, & F. Recknagel), WIT Press. 2009, 3) H. T. Odum, Systems ecology, Wiley, 1993, 4) J. R. Krebs and N. B. Davies, 1993, An introduction to behavioral ecology, Blackwell, 5) D. Lendrem, 1986, Modelling in behavioral ecology: an introductory text. Croom Helm, 6) M. A. Nowak, 2006. Evolutionary dynamics: exploring the equations of life. Belknap Press of Havard Univ., 7) Y. Iwasa, 1998, Mathematical biology: exploring dynamics in biological societies (In Japanese), Kyoritsu Press: Tokyo, and 8) Y. Iwasa, 2008, Mathematical principles in life events (In Japanese), Kyoritsu Press: Tokyo.

(関連URL)

((Will be announced later))

## [授業外学修(予習・復習)等]

Essential issues (i.e., key terminology, concepts, preparatory ideas) will be given before each lecture. The students are expected to learn about the essential issues and find related examples before each lecture. After each lecture the review of the lecture could be conducted by the students with focus on theoratical and practical applications of the concepts learned in the lecture to real situations in the fields. The pre- and post-lecture study may require about 1 - 2 hour for each lecture.

During the course work assignments will be given to the students two times. Each assingment may require half-full working hours for a day (around four - eight hours) for preparation.

# [その他(オフィスアワー等)]

1. ""Office hours"" will be registered on KULASIS. The registered data may be changed without notice in advance.

2. If the students have notebooks the students are encouraged to bring the notebooks to class to run example programs. Programs for examples may be provided by the lecturer and/or the University.

3. The students may visit some ecological sites (e.g., small-size forest, small stream) within the Campus according to the progress of course work.

4. Power point files would be provided to the students for each lecture. The email address of the lecturer will be separately notified in the Class.

5. The announcement of grading for students will be announced later in the Class.

6. Active participation by the students is expected including inquiries and comments in the lectures.

# [主要授業科目(学部・学科名)]