

Ecology and Conservation	
Course Code	DIC 8001
Credits	Three (lectures: 3 hr per week)
Organizers	Chung-Chi Chen and Teng-Chiu Lin
Lecturers	Hwey-Lian Hsieh, Chung-Chi Chen , Allen Chen, Tung-Yuan Ho, Sheng-Feng Shen, Benny Chan
Time	Monday 14:10-17:00
Place	1. S605, NTNU (first class) 2. B208, BRC, AS
Description	<p>This course aims to provide students with rigorous training related to ecology and conservation. The course will cover the following topics:</p> <ol style="list-style-type: none"> 1. Structure and function of community and ecosystem: Interactions between physical setting and biological components Driving forces of ecosystem 2. Habitat requirement of non- human keystone species in ecosystem Identification and characterization of habitat required by species through its life history 3. Key processes related to ecosystem structure and function Net primary production Biogeochemistry Ecosystem stability, resistance and resilience 4. Conservation of ecosystem Global warming threat and human responses and adjustments Characterizing ecosystem or habitat that needs for maintenance, wise use, or restoration practices (case studies) in conserving ecosystems 5. Ecological services and valuation of ecosystem: From structure, function, and services of ecosystem to human well-being <p>Selected readings that represent major advancement in ecology and conservation and related to the above topics will be given to students for in depth discussion. Professor(s) will give brief lectures on the topics and lead the discussion for approximately one quarter of the semester and students will lead the discussion for the rest. Through the discussion each student is expected to develop a review essay as a term paper. Questions and solutions raised in the discussions are expected to make major contributions in ecology and conservation. Novel approaches and inter-disciplinary studies are highly encouraged.</p>
Purpose	<ol style="list-style-type: none"> 1. Lectures and assigned readings are designed to provide fundamental knowledge in ecology and conservation. 2. Students will identify an area of interest and come up with a research proposal that aims to answer an outstanding question in that area.

Course work reminder:

1. each student hands in Midterm paper essay
2. each group hands in Term paper essay
3. each student studies on assigned papers, field observations, and subsequent discussion according to each lecturer's specific requirement

Weeks taken/ Ecosystem	Content	Lecturer/ Reading Material
Week 1 2/17 Introduction	Hwey-Lian Hsieh Overall briefing	Reading materials for midterm paper Ehrlich PR, Ehrlich AH 2013. Can a collapse of global civilization be avoided? <i>Proceedings of the Royal Society B</i> 280:20122845 And 5 more articles related to this article
Week 2~ 3 Open ocean ecosystems	Chung-Chi Chen & Tung-Yuan Ho -Marine environments - Climate change and Sustainable development - Acidification	
Week 2 2/24 Anthropogenic impacts on marine environments	Physical and chemical conditions in the open ocean and anthropogenic impacts on marine ecosystem 1. Overview of marine environment; 2. Effects of climate change on marine ecosystems: example from the East China Sea; 3. Hypoxia in the East China Sea.	Chung-Chi Chen Each student should pick up an article based on his (her) own interesting and do 15 mins presentation on how human interference on marine ecosystems Reading materials: 1. Speight, M. R. and R. A. Henderson. 2010. <i>Marine Ecology: Concepts and Applications</i> . Wiley-Blackwell. ISBN-10: 1444335456. (Ch. 1, 2, 7, 11, 12). 2. Chen, C.-C., G.-C. Gong, F.-K. Shiah, W.-C. Chou, and C.-C. Hung (2013). The large variation in organic carbon consumption in spring in the East China Sea. <i>Biogeosciences</i> 10: 2931-2943. doi:10.5194/bgd-10-2931-201 3. Chen, C.-C., F.-K. Shiah, K.-P. Chiang, G.-C. Gong, W. M. Kemp (2009). Effects of the Changjiang (Yangtze) River discharge on planktonic community respiration in the East China Sea. <i>J. Geophys. Res.</i> 114, C03005, doi: 10.1029/2008JC004891. 4. Chen, C.-C., G.-C. Gong, and F.-K. Shiah (2007). Hypoxia in the East China Sea: one of the largest coastal low-oxygen

		areas in the world. <i>Mar. Environ. Res.</i> 64: 399-408.
Week 3 3/3 Global Environmental Changes in the Ocean	Ocean acidification and temperature increase in oceanic surface waters	Tung-Yuan Ho Reading materials: 1. Scott C. Doney, Victoria J. Fabry, Richard A. Feely, and Joan A. Kleypas (2009). Ocean Acidification: The Other CO ₂ Problem. <i>Annual Review of Marine Science</i> . Vol. 1: 169-192 2. Scott C. Doney (2010). The Growing Human Footprint on Coastal and Open-Ocean Biogeochemistry. <i>Science</i> 328, 1512 3. Orr JC, Fabry VJ, Aumont O, Bopp L... Totterdell IJ, Weirig MF, Yamanaka Y, Yool A. (2005). Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms. <i>Nature</i> 437, 681-686
Week 4~5 Forest ecosystems	Sheng-Feng Shen Ecology and Conservation -Insects communities/ environment interactions -Global warming and Sustainable development	
Week 4 3/10 Introduction of Forest ecosystem	Biodiversity of forest ecosystem.	Reading materials: Chapter 3-5, Lee Hannah (2011) <i>Climate Change Biology</i> . Academic Press.
Week 5 3/17 Impacts of Global Change on Forest ecosystem	Impacts of climate change and habitat alternation on the forest ecosystem.	
Week 6~ 11 Wetland ecosystems (coasts, estuaries, freshwater systems)	Hwey-Lian Hsieh - Aquatic animals/environment interactions - Habitat restoration principles and practices - Functions of wetland ecosystem - Ecosystem services and human wellbeing - Management	
Week 6 3/24	1. Driving forces of aquatic ecosystem-Interactions between physical settings and biological components- Infauna assemblage as example 2. Progress report on group studied subject for the Term paper	Reading materials: 1. Odum HT, Odum EC 2006. The prosperous way down. <i>Energy</i> 31:21-32. And, this issue related literature. 2. Odum EC 2004. A prosperous

Week 7	3/31	Field trip (I)- Biodiversity of wetlands (options- Ecopond of Academia Sinica; an estuarine or coastal wetland, tides and weather dependent)	way down. In Ortega E & Ulgiati S (eds) <i>Proceedings of IV Biennial International Workshop</i> “Advances in Energy Studies”. Unicamp, Campinas, SP, Brazil. June 16-19, 2004, p 1-10.
Week 8	4/7	<ol style="list-style-type: none"> 1. Characterizing natural resources that need for maintenance, wise use, or restoration practices in conserving ecosystems – Horseshoe crab story 2. Discussion on the observations of the field trip (I) 	
Week 9	4/14	<ol style="list-style-type: none"> 1. Restoration of habitat diversity in mangrove ecosystem 2. Mechanism of ecological services and its connection to human wellbeing: From structure, function, and services of ecosystem to human wellbeing 	
Week10	4/21	Field trip (II)- Biodiversity of constructed wetlands and Wetland Story Center in New Taipei County (weather dependent)	
Week 11	4/28	Hwey-Lian Hsieh Mid-term assay report on assigned articles due Discussion on the observations of the field trip (II)	
Week12~17 Coral reef and Rocky shores ecosystems		Hwey-Lian Hsieh, Benny Chan, and Allen Chen -Functions of coral reefs and rocky shores -Management (e.g. Designation of marine protected area)	
Week 12	5/5	Progress report on group studied subject for the Term paper	
Week 13	5/12	Field Trip: Natural and artificial rocky shores– a comparison	Benny Chan
Week 14	5/19	Natural and artificial rocky shores – a comparison (Discussion)	
Week 15	5/26	Coral reef ecology and conservation	Allen Chen
Week 16	6/2	Dragon Boat Festival	
Week 17	6/9	-Natural and anthropogenic disturbances on coral reefs -Historical degradation of coral reefs	
Week 18	6/16	-Response mechanisms of coral reefs to climate change -Marine protected areas and conservation of coral reefs	
Week 19	6/23	Hwey Lian Hsieh Final term paper and evaluation of performance	