國立東華大學

課　　綱　Course Outline

自然資源與環境學系碩士班

中文課程名稱 Course Name in Chinese	地表過程專論				
英文課程名稱 Course Name in English	Topics in Earth Surface Processes				
科目代碼 Course Code	ES__50500	班 別 Degree	碩士班 Master’s		
修別 Type	選修 Elective	學分數 Credit(s)	3.0	時 數 Hour(s)	3.0
先修課程 Prerequisite					

課程目標
Course Objectives

建立學生地表變遷過程之基礎知識，包含對地表過程可能外營力與內營力之認識與如何著手調查地表變遷之相關研究。

系教育目標
Dept.’s Education Objectives

1	培養兼具國際視野與本土關懷的學生 To develop students who care about local issues and have an international perspective
2	培養具備自然科學與社會科學知識的人才 To educate students to have knowledge of both the natural and social sciences
3	培養具備環境倫理與人文素養的環境公民 To teach students to be environmental citizens (i.e., knowledgeable about environmental ethics and human issues)

	系專業能力 Basic Learning Outcomes	課程目標與系專業能力相關性 Correlation between Course Objectives and Dept.’s Education Objectives
A	能覺知多元的自然科學與社會科學理論並具備研究能力 To have knowledge of natural and social science theories	●
B	具備自然資源與人類社會議題之調查分析、規劃與經營之能力 To be able to investigate, analyze, plan, and manage both natural resource and human social issues	●
C	具備將環境倫理與生態思想落實於永續性生活型態的能力 To implement sustainable lifestyles based on environmental ethics and ecological principles	●

D	能以整全式的觀點來解析環境問題，並具備發展系統性解決方案的能力 To resolve environmental issues and develop systematic solutions with a global perspective	●
E	具備系統分析、未來思考、溝通協調與團隊合作的能力 The ability to analyze, plan, communicate, and coordinate with others (teamwork)	●
F	具備終身學習、國際視野與外語溝通的能力 To instill the values of lifelong learning, an international perspective, and the ability to communicate in a foreign language	○

圖示說明Illustration ：● 高度相關 Highly correlated ○中度相關 Moderately correlated

課程大綱
Course Outline

區分為兩部分，第一部分為建立以地球為完整單位之系統觀，全球思考(Thinking globally: the global Earth surface system)包含以下四個主題，

1. 地表系統組成要素(Fundamentals of the Earth surface system)
2. 環境變遷:過去,現在與未來(Environmental change: past, present and future)
3. 沉積物產生,搬運與堆積過程(Liberation and flux of sediment)
4. 大比例尺地表變遷(板塊地質學,地體動力學與地震)(Global scale earth surface processes)

第二部為針對不同次系統進行研究調查，地方行動(Acting locally: Fluid and sediment dynamics) 包含以下十一個主題，提供研究不同主題之科學方法與理論，

5. 流體力學(Some fluid mechanics)
6. 沉積物搬運(Sediment transport)
7. 高密度沉積物之水流模式(Hyperconcentrated and mass flows)
8. 噴射氣流,河川與海水間水流混合過程(Jets, plumes and mixing at the coast)
9. 潮汐與洋流(Tides and waves)
10. 地表過程定量模式(1)塊體運動與山坡作用(Hillslope processes)
11. 地表過程定量模式(2)質量守恆與擴散方程式(Mass balance and diffusion function)
12. 地表過程定量模式(3)山崩與崩塌地
13. 地表過程定量模式(4)河道發育過程(侵蝕)
14. 地表過程定量模式(5)河道堆積過程(階地與沖積扇)
15. 地表過程定量模式(6)海底濁流

資源需求評估（師資專長之聘任、儀器設備的配合・・・等）
Resources Required (e.g. qualifications and expertise, instrument and equipment, etc.)

野外調查車輛與設備

課程要求和教學方式之建議
Course Requirements and Suggested Teaching Methods

課堂講授、作業與報告

其他
Miscellaneous

教科書

Earth Surface Processes. (1997) by Philip A. Allen, Publisher: Blackwell Science, London. (http://onlinelibrary.wiley.com/book/10.1002/9781444313574)

Planet Earths: An introduction to Earth Sciences (2002) by R. N. Anderson (http://www.ldeo.columbia.edu/res/pi/4d4/planet/)

Quantitative modeling of Earth surface processes. (2008) by Jon Pelletier, Publisher: Cambridge University Press.

THE LITTLE BOOK OF GEOMORPHOLOGY (2008) by R.S. Anderson (http://instaar.colorado.edu/~andersrs/The_little_book_010708_web.pdf)

參考書與期刊

第一主題參考文獻

Geosystems (by Robert W. Christopherson, 2003, 5th edition) Publisher: Prentice Hall, New York.
Aquatic Chemistry (by Werner Stumm and James J. Morgan, 1996, 3rd edition) Publisher: Wiley Interscience, John Wiley & Sons, INC., New York.
http://www.ldeo.columbia.edu/res/pi/4d4/planet/Planet_Earth_Topic_1.pdf

第二主題參考網站: Paleoclimatology

http://www.ncdc.noaa.gov/paleo/paleo.html
http://gcmd.nasa.gov/Resources/Learning/data.html
http://www.ldeo.columbia.edu/res/pi/4d4/planet/Planet_Earth_Topic_2.pdf

第三與六主題參考文獻:

http://www.ldeo.columbia.edu/res/pi/4d4/planet/Planet_Earth_Topic_5.pdf
Li, Y. H. (1976) Denudation of Taiwan island since the Pliocene epoch. Geology, 4, 105–107.
Allen, P. A. and Densmore, A. L. (2000) Sediment flux from an uplifting fault block., Basin research., 12 (3-4). 367-380.
Hovius, N., Stark, C. P., Chu, H. T. and Lin, J. C. (2000) Supply and Removal of Sediment in a Landslide-Dominated Mountain Belt: Central Range, Taiwan. The Journal of Geology, 108, 73–89
Fluvial landscape response time: how plausible is steady-state denudation?, Am. J. Sci., 301, 313-325. Whipple, K. X., and Tucker, G. E., 2002 (http://whipple_arrowsmith598.asu.edu/ Papers/whipple_01.pdf)
Hartshorn, K, Hovius, N. and Slingerland, R. (2002) Climate-Driven Bedrock Incision in an Active Mountain Belt, Science, 297, 2036-2038
Dadson, S. J, Hovius, N., Chen, H., Dade, W. D., Hsieh, M. L., Willett, S.D., Hu, J. C., Horng, M. J., Chen, M. C., Stark, C. P., Lague, D. and Lin, J. C. (2003) Links between erosion, runoff variability and seismicity in the Taiwan orogen. Nature 426, 648 – 651.
Penrose Conference, Geological Society of American (2003) January 13-17, 2003, Taroko National Park, Taiwan.
THE LITTLE BOOK OF GEOMORPHOLOGY Chaps.9 and 14.

第四主題參考文獻:

http://www.ldeo.columbia.edu/res/pi/4d4/planet/Planet_Earth_Topic_3.pdf
http://www.ldeo.columbia.edu/res/pi/4d4/planet/Planet_Earth_Topic_4.pdf
Anderson, Don L. (2007) New Theory of the Earth. Cambridge University Press. ISBN 978-0-521-84959-3, 0-521-84959-4 http://resolver.caltech.edu/CaltechBOOK:2007.001
http://caltechbook.library.caltech.edu/151/
GMT script to download - Home - Caltech: Geological and Planetary-
http://www.gps.caltech.edu/~jstock/cmt_plot_2009.gmt
4D Technology: http://www.ldeo.columbia.edu/research/projects-initiatives

第五、六與七主題參考文獻:

Physics of Sedimentology: Textbook and Reference (2004) by K. H. Hsu, 2nd, Springer Verlag.
Paola, C., (2005), Physics of Sedimentology: Textbook and Reference, Eos Trans. AGU, 86(2), 20, doi:10.1029/2005EO020007.

第八與九主題參考文獻:

http://onlinelibrary.wiley.com/doi/10.1002/9781444313574.ch7/summary
http://onlinelibrary.wiley.com/doi/10.1002/9781444313574.ch8/summary

第十至十五主題參考文獻:

Hillslope Processes, Drainage Density, and Landscape Morphology (1998) Gregory E. Tucker1 and Rafael L. Bras (http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.30.4806&rep=rep1&type=pdf)
THE LITTLE BOOK OF GEOMORPHOLOGY Chap.10.

Physics of Sedimentology: Textbook and Reference (2004) by K. H. Hsu, 2nd, Springer Verlag.