

農業水域環境評估

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本課程是從水環境的方向出發，有鑑於農地的污染物，水分為最主要攜帶媒介。課程主要內容中將介紹，藉由監測與模式模擬了解農業環境中的污染物的命運及動態，再以水分管理的方式提出減少農田的遭受污染的策略。因此，本課程對本系從事農業環境研究工作的研究生有實質的幫助外，對本學院農業系統環境工程或環工所對農田水分管理或是水生生態環境有興趣的同學都是很好學習的機會。

基本資訊	
課程名稱	農業水域環境評估 (Agricultural aquatic environment assessment)
開課學期	103-1
授課對象	農業化學系 農業化學研究所
課號	623 U4530
班次	
上課時間	第一節 9月15日 5:30pm (顏瑞泓)必到 第二節 9月18日 6:30~8:20pm (Watanabe Hirozumi) 第三節 9月19日 6:30~8:20pm (Watanabe Hirozumi) 第四節 9月22日 6:30~8:20pm (Watanabe Hirozumi) 第五節 9月23日 6:30~8:20pm (Watanabe Hirozumi) 第六節 9月24日 6:30~8:20pm (Watanabe Hirozumi)
上課地點	農化二 B10
備註欄	
課程網址	
核心能力關聯	博士班 <ul style="list-style-type: none">熟識與活用所學的專業知識，符合國家專業人才之需求瞭解農業化學與永續糧食生產、氣候變遷、保護人類健康及生物資源開發與利用之關係

	<p>碩士班</p> <ul style="list-style-type: none"> • 熟識與活用所學的專業知識，符合國家專業人才之需求 • 瞭解農業化學與永續糧食生產、氣候變遷、保護人類健康及生物資源開發與利用之關係
課程概述	<p>本課程係以生物資源暨農學院學生為主要授課對象，共一個學分。</p> <p>The lecture materials are prepared considering interdisciplinary approach in which students can be exposed to the fundamentals of aquatic ecology, aquatic chemistry, and hydrology as well as the applications of environmental monitoring and modeling.</p> <p>The first half of the class lectures introduce basic functions of aquatic environment, followed by the environmental hydrology, water chemistry and aquatic pollution. The second half of the class continues with discussion of the environmental fate, chemical analysis, monitoring and modeling for aquatic pollutants.</p> <p>Course outline: (Total 18 section)</p> <ol style="list-style-type: none"> 1. Class orientation <ol style="list-style-type: none"> a. Self interlocution for instructor and students b. Class objectives, general contents and schedule 2. The aquatic environment—an overview— <ol style="list-style-type: none"> a. Global water distribution b. Aquatic environments c. Lakes and ponds d. Streams and Rivers e. Estuaries f. Wetlands 3. Environmental hydrology I <ol style="list-style-type: none"> a. Properties of water b. Hydrologic cycle c. The natural spheres 4. Environmental hydrology II <ol style="list-style-type: none"> a. Precipitation b. Evapotranspiration c. Runoff processes and stream flow 5. Environmental hydrology III <ol style="list-style-type: none"> a. Soil water and ground water b. Water balance 6. Water quality I

- a. Water chemistry—pH, acid base chemistry
- b. Dissolved oxygen (DO) and Eh
- c. Solar radiation and Temperature
7. Water quality II
 - a. Aquatic pollution
 - b. Solids
 - c. Salts and salinity
 - d. Turbidity
 - e. BOD, COD
 - f. Nitrogen and phosphorus
 - g. Eutrophication
8. Environmental fate of the pollutant I
 - a. Partitioning of pollutants in the environment
 - b. Gas/solution phase Henry's law
 - c. Volatilization
 - d. Solubility
 - e. Octanol/Water partitioning K_{ow}
9. Environmental fate of the pollutant II
 - a. Liquid/solid phase partitioning, adsorption and desorption
 - b. Degradation
 - c. Reaction
 - d. The first order reaction kinetics
 - e. Diffusion and dispersion
10. Mid term exam
11. Water quality monitoring I
 - a. Previous example projects
 - b. Plot scale monitoring
 - c. Pollutant fate and transport
 - d. Water balance monitoring
12. Water quality monitoring II
 - a. Monitoring pollutant concentration
 - b. Watershed scale monitoring
 - c. Monitoring and Lysimeters
 - d. Sampling and chemical analysis
13. Introduction to water quality modeling I
 - a. Concept, method procedure
 - b. Water quality models

	<p>c. Modeling environmental fate of the pesticide fate and transport in paddy field</p> <p>14. Introduction to water quality modeling II Model exercise (Bring your laptop)</p> <p>15. Introduction to water quality modeling III Model exercise (Bring your laptop)</p> <p>16. Environmental risk assessment of rice pesticide in rice paddies a. Overview of pesticide risks in agricultural environment b. Exposure risk assessment of rice pesticide in rice paddies by PCPF model c. Eco-toxicological risk assessment</p> <p>17. Class summary, Discussion and class evaluation</p> <p>18. Final exam</p>
課程目標	The objectives of this course is to gain broad knowledge and concept which can be applies for the investigation and assessment of the environmental risk associated with the inorganic and organic pollutants such as nutrients, heavy metals and pesticides in the aquatic environments such as streams, rivers and lakes.
課程要求	英文授課
關鍵字	Aquatic environment, Nonpoint source pollution, Risk assessment, Monitoring, Modeling
指定閱讀	William F. Ritter Adel Shimohammadi, 2001, Agricultural nonpoint source pollution watershed management and hydrology, CRC Press LLC.
Office Hours	
參考書目	<ol style="list-style-type: none"> 1. Andy D. Ward and Stanley W. Trimble, 2004, Environmental hydrology, 2nd edition, CRC Press LLC. 2. Horne A. J., and Goldman, C. R., 1994, Limnology, 2nd edition. McGraw-Hill, Inc. New York. 3. Maidmend, D. R. ed., 1992, Handbook of hydrology, McGraw-Hill, Inc. New York. 4. Snoeyink, V. L. ed., 1980, Water Chemistry, John Wiley & Sons, Inc. 5. Tchobanoglous, G. and E. D. Schroeder, 1985, Water quality, Addison-Wesley Publishing Company. 6. Karpouzias, Dimitrios and Capri Ettore ed., 2007, Pesticide risk assessment in rice paddies: Theory and practice, Elsevier science Ltd.

評量方式

編號	項目	百分比	說明
			Participation in the class and homework assignment (50%), Midterm exam (20%), and Final exam (30%)

研究專長：

渡邊教授長久以來致力於改善因農用化學品的施用而遭到破壞的農業環境，並提出農田水分管理策略，有效減少因水分淋洗或逕流而流佈至環境中的農用藥劑的量，提升農藥的使用效率，達到改善農業生產環境優化的目的。尤其渡邊教授實際田間水分管理經驗豐富，合作研究遍及亞洲各國（台、日、韓、中、菲、泰、馬、印尼、緬甸、越南等國）因此，邀其為本系開課除課程內容外，其與各國間許多重要的研究經驗傳遞也將是課程內容的重點。

其近年來主要研究目標有下列五點：

- (1) 農藥在環境中的命運及傳輸動態
- (2) 監測農藥的水體環境中的變化及傳輸
- (3) 發展預測模式以對農藥施用後在環境中的命運進行預測
- (4) 發展最佳的農業操作及管理模式有效減少施用的農藥自農田向外流佈
- (5) 進行整體環境風險評估

In order to improve water quality affected by agricultural chemicals, we would like to contribute our effort on following objectives:

- (1) Investigate mechanisms of pesticide fate and transport
- (2) Monitor pesticide fate and transport in aquatic environments
- (3) Develop simulation models for pesticide fate and transport
- (4) Develop Best Management Practice or Good Agricultural Practice for reducing pesticide losses from agricultural fields.
- (5) Environmental risk assessments