

國立中正大學課程大綱
National Chung Cheng University
Course Syllabus

學年/學期(Academic Year / Semester)	114-2		
課程名稱(Course name)	高等環境奈米 Environmental Nanotechnology		
課碼(Course code)	2708071	學分數 Credit(s)	3
授課教師(Instructor)	Prof. Chien-Yen Chen & Dr. Raju Kumar Sharma Email: chien-yen.chen@oriel.oxon.org Tel: +886-5-2720411 ext. 66220		
授課方式 (teaching methods)	<input type="checkbox"/> Lab <input type="checkbox"/> Seminar <input checked="" type="checkbox"/> Student Presentation <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Other		
先修科目(Prerequisite)	This course is intended for graduate students in Environmental Engineering, Chemical Engineering, Materials Science, Chemistry, Soil and Water Sciences, Geology, and Environmental Science. A strong background knowledge in chemistry and environmental microbiology necessary.		
課程介紹與教學目標 (Course Description and Objectives)	<p>Course Description—(3 credits): The increase in production and use of engineered nanomaterials is raising concerns on their potential impacts on the environment and human health. A sustainable development of nanotechnology requires knowledge of life cycle and environmental fate/implications of nanomaterials. This course focuses on linkages between nanomaterials properties and environmental implications.</p> <p>Objectives: Students who successfully complete this course should have:</p> <ul style="list-style-type: none"> a. An understanding of the properties of nanomaterials which affect their environmental fate. b. An understanding of the toxicity and toxicity mechanisms of nanomaterials c. Familiarity of applications of nanomaterials and their environmental effects 		
教科書及參考書 (Textbooks and References)	<p>Wiesner M.R. and J-Y Bottero. 2007. Environmental nanotechnology: Applications and Impacts of nanomaterials. McGraw Hill (ISBN-13: 978-0-07-147750-5)</p> <p>Theodore L. and R.G. Kunz. 2005. Nanotechnology: Environmental Implications and Solutions. ISBN. 0-471-69976-4, John Wiley & Sons, Inc.</p>		

學習評量與成績配分 (Assessment and Grade scale)	Exam-1.....20% (Week-08) Exam-2.....30% (Week-16) Homework.....20% Oral Presentations.....30%
課程要求 (Course Requirements)	Attendance is required
課程進度(Course Schedule)	
Week	Contents
PART-1:	INTRODUCTION TO NANOTECHNOLOGY AND NANOSCIENCE
Week 01	How will Nanotechnology Change our World? The Power of small size particles From atomic building blocks of matter to particles of different sizes
Week 02	Physicochemical characteristics of particles as a function of size
PART-2:	MANUFACTURING OF NANOMATERIALS
Week 03	Natural and engineered nanomaterials. Overview of the different production and synthesis methods of engineered nanomaterials
PART-3:	APPLICATIONS OF NANOMATERIALS
Week 04	Example applications of engineered nanomaterials: Medical, Agricultural, Environmental, Industrial
Week 05	Example applications of engineered nanomaterials: Environmental, Industrial
PART-4:	IMPLICATIONS OF NANOMATERIALS Basic Concepts in Environmental Microbiology and Toxicology
Week 06	Introduction to Environmental Microbiology Introduction to Ecotoxicology: Typical toxicity methods, Routes of exposure and toxicity mechanisms
Week 07	Implications for risk assessment of engineered nanomaterials o Pollutant Interactions with cell membranes o Predictive approaches/tools o Bioaccumulation o Food transfer and bio-magnification
Week 08	Mid-term Exam
PART-5:	Engineered Nanomaterials: Fate, Transport & Toxicity
Week 09	Connectedness of the Geospheres and Fate of Pollutants
Week 010	Aqueous solubility and factors influencing solubility
Week 011	Phase partitioning in natural systems

Week 012	Transport in aquatic and soil systems
Week 013	<input type="checkbox"/> Toxicity case studies
PART-6:	Life Cycle Assessment (LCA) and Sustainable Nanotechnology
Week014	LCA and Nanotechnology Stages of LCA: Inventory Analysis, Impact Analysis, Improvement Analysis Case Studies Green manufacturing of nanomaterials
PART-7:	PAPER PRESENTATIONS
Week 015	Specific Topic Lecture by students
Weel016	Final Exam