

Nanotechnology in Agriculture and the Environment

COURSE IDENTIFICATION

CODE	SEM	HT	HS	HP	HA	CR SCT	PREREQUISITES	COURSE LEVEL OR CATEGORY	RESPONSABLE UNIT
	Summer School	1	0	0	2	2	Postgraduate inscription	Elective	Postgraduate School

One SCT credit point is equivalent to 25 student learning hours.

COURSE DESCRIPTION

This course presents an introduction into nanotechnology. With an overview of the methods used for synthesis of nanoparticles and their physical characteristics. With this background there will be a presentation of specific applications for the use of nanotechnology in the areas of agriculture and the environment. Examples will be provided from the literature and (where available) examples from an applied context. The student will be expected to end this course with a good understanding the expected benefit and challenges to using nanotechnology in an agricultural and environmental context

LEARNING STRATEGIES

Lectures, group discussion.

COURSE COMPETENCIES (Type: B=Basic, G=Generic, E=Specific)

At the conclusion of this class, students will be able to:

- List forms of nanomaterials and their general properties (B).
- Have a good understanding of the use of nanotechnology in an agricultural and environmental remediation context (E).
- Be aware of the potential downsides of the use of nanotechnology and of methods that can be used to ameliorate them (G).

LEARNING RESOURCES

Lectures. Case studies. Student debates.

COURSE OUTLINE

Chapter	Content
Small and Mighty: An introduction to nanotechnology	An overview of the field of nanotechnology. Divided into three sections, what is nanotechnology, the physical properties of nanomaterials, and examples of nanomaterials and how they are created
Nanosensors: an agricultural context	Due to their physical properties, nanomaterials are often utilized as sensors for the detection of chemical species. This topic will discuss the application of nano-sensor technology in an agricultural context.
Nanofarming: Applied nanotechnology in agriculture	This topic will address the use of nanotechnology in a direct agricultural context, the sections will address, nanofertilizers, nanopesticides and nanomedicine in an agricultural context
Environmental remediation with nanotechnology	Nanomaterials show a number of properties which makes them suitable for use as agents for the remediation of environmental damage. This topic will be an overview of the application of nanomaterials for the remediation of water, and soil resources.
Nanotoxicology: The dark side of the nano revolution.	While nanomaterials show great promise in a range of applications. There have also been issues with the potential impacts that these nanomaterials can have on the environment and human health. This topic will be a brief overview of the toxicological impacts of nanomaterials followed and strategies that can be utilised to reduce them.

Reading Materials

- Shivendu Ranjan, Nandita Dasgupta and Eric Lichtfouse: 2017 Nanoscience in Food and Agriculture 4, Sustainable Agriculture Reviews book series (SARV, volume 24), Springer p.305
- Azamal Husen and Mohammad Jawaid (Eds.) Nanomaterials for Agriculture and Forestry applications, Elsevier p.532
- Dong-Wook Han and Wojciech Chrzanowski (Eds.) 2018, Frontiers in Toxicity and Functionalization of Nanomaterials, Nanomaterials MDPI p.172
- Kamel A. Abd-Elsalam (Ed) 2019. Carbon nanomaterials for Agri-food and environmental applications. Elsevier p.652

INSTRUCTORS (List non-exclusive)

<i>Instructor</i>	<i>Department</i>	<i>Area or major field</i>
Joseph Govan	Soil and Engineering, University of Chile	Sustainable soil and water management

GRADING (under review every term)

<i>Activity</i>	<i>Percentage (%)</i>
Case study presentation	50
Literature review	50