

NANO AGRICULTURE ENGLISH LANGUAGE COURSE

IDENTIFICACIÓN DE LA ASIGNATURA

CÓDIGO	SEM 9º=Otoño 10º=Primavera	SCT presencial	SCT Alumno	SCT* total	Requisito	Línea de formación y tipo de asignatura	Unidad responsable
EPNAAGRI-1	10	1	1	2**	Inglés, Física I, Química	Electiva profesional IAGRO e IRNR	Departamento de Ingeniería y Suelos

*SCT: Sistema de Créditos Transferibles, SCT presencial= horas teóricas y/o /prácticas.

** Para alumnos de IAGRO e IRNR (Planes anteriores a 2021) la asignatura tendrá una equivalencia de 4UD.

DESCRIPCIÓN DE LA ASIGNATURA (Course Description)

Nanotechnology and nanoscience are the study of very small particles and structures (between 100-1 nm). In this size range, materials exhibit distinct properties that are not found in the same materials in the macroscale. These properties permit applications in diverse areas like electronics, medicine and materials science.

The course will integrate knowledge of chemistry, physics with the applications of nanotechnology and nanoscience in order to visualize its use in the agrifood and environmental sectors. To be studied are the different classes of nanomaterials investigated in nanoscience, their properties and creation. It will give special emphasis in the application of these materials in agriculture and food production.

RESULTADOS DE APRENDIZAJE (Learning Outcomes)

- *Understand and analyze the physics and chemistry of nanomaterials, their specific applications with respect to the agricultural and food sectors, the potential of future applications on these systems, and the visualization of the impact of the use of nanomaterials on the environment.*
- *Understand the possibilities and challenges of the use of nanomaterials and other forms of nanotechnology in the formation of a sustainable agri-food sector with low environmental impact.*
- *Analyze the literature and other sources critically.*

ESTRATEGIAS METODOLÓGICAS (Teaching and Learning Methods)

The course will be conducted in a hybrid manner, Lectures, Self-study, Study project.

An examination of techniques for conducting a search of bibliographic sources related with the Study Project will be conducted (Marks will be connected with quality of the source, quality of the work, relatedness to the study project theme and extent to which the results are state of the art)

RECURSOS DOCENTES:

Audiovisual resources like ppt presentations and class recordings on the UCursos Platform. Library access, both physical and electronic.

CONTENIDOS (Topics)

CHAPTER	TOPICS
1. What are nanomaterials?	A general vision of nanomaterials
	The general physics of nanomaterials, why do they behave so strangely?
2. Types of nanomaterials	A description of various classes of nanomaterials, synthesis methods and potential applications.
	Types of nanomaterials included are metal particles (gold, silver, copper etc), quantum dots, magnetic nanomaterials, clays, carbon nanomaterials (fullerenes, carbon nanotubes, graphene etc), and polymers.
3. Nanomaterials in Agriculture.	Nanosensors: The use of nanosensors to monitor field conditions.
	Nanofertilizers: The use of nanomaterials to deliver nutrients or otherwise promote crop growth.
	Nanopesticides: The use of nanomaterials to deliver pesticides or reduce the activity of pests and other factors that can reduce yield.
4. Nanomaterials in the food industry	The use of nanomaterials in food packaging to protect and monitor food.
	The use of nanomaterials to create better food and maintain its quality.
5. Nanomaterials in the environment.	The use of nanomaterials in the remediation of the environment.
	Nanomaterials as pollutants. Methods to prevent their loss to the environment.
6. Nanotoxicology	The effects of nanoparticles on human health. How to reduce the risk.
7. Nanotechnology in the real world	Examples of commercial nanotechnology being used in the agrifood and environmental sectors

Classes will be held at 11:30 AM (Chilean Time) in a hybrid manner on the following dates.

Week	Date	Activity Type	Theme	PROFESSOR
1	06/09/2023	Class	Introduction, what is nanotechnology	Joseph Govan

	13/09/2023	Recess	Vacation University Recess	N/A
2	20/09/2023	Class	Types of Nanomaterials 1	Joseph Govan
3	27/09/2023	Class	Types of Nanomaterials 2	Joseph Govan
4	04/10/2023	Class	Types of Nanomaterials 3	Joseph Govan
5	11/10/2023	Class	How to search the literature	Joseph Govan
6	18/10/2023	Class	Nanotechnology in agriculture 1	Joseph Govan
7	25/10/2023	Class	Nanotechnology in agriculture 2	Joseph Govan
	01/11/2023		All Saint's Day Vacation	N/A
8	08/11/2023	Class	Nanotechnology in agriculture 3	Joseph Govan
9	15/11/2023	Class	Nanotechnology in food 1	Joseph Govan
10	22/11/2023	Class	Nanotechnology in food 2	Joseph Govan
11	29/11/2023	Class	Nanotechnology and the environment 1	Joseph Govan
12	06/12/2023	Class	Nanotechnology and the environment 2	Joseph Govan
13	13/12/2023	Class	Nanotoxicology	Joseph Govan
	20/12/2023		Pause	N/A
14	27/12/2023	Class	Nanotechnology in the Real World	Joseph Govan
15	03/01/2024	Evaluation	Student Presentations	Joseph Govan

PROFESORES PARTICIPANTES (Course Coordinator and Lecturer)

<i>Profesor</i>	<i>Departamento</i>	<i>Especialidad o área</i>
Dr. Joseph Govan, Profesor asistente	Ingeniería y Suelos	Nanotecnología agrícola

STUDENT EVALUATION

<i>Instrumentos</i>	<i>Ponderación</i>
Class activities, short quizzes at the end of the class (<5 min.)	10%
Bibliographic search	20%

Essay (A report on the theme of nanotechnology in the agri-food sector or the environment.)	35%
Study Project related to the topics of the course (report 20% and presentation 15%)	35%
Cumulative scores (NPE)	100%
FINAL QUALIFICATION = (70% NPE) + (30% FINAL EXAM RESULT *)	

**The Final Exam will include all topics covered during the semester to demonstrate achievement and it will be optional for any student with a NPE $\geq$ to 4,5. Students that choose this option will have a Final Grade = to NPE.*

GRADING SYSTEM FOR INTERNATIONAL STUDENTS

SCT Credits: 1 credit at Universidad de Chile corresponds to 27 hours of total student work during the semester (lecturing and autonomous work)

Mark	Standard
7.0	Superior Achievement
6.0 – 6.9	Very Good
5.0 – 5.9	Good
4.0 – 4.9	Fair – Passing Grade
1.0 – 3.9	Fail

REFERENCES

1. Booker R., Boysen E, 2005, Nanotechnology for dummies, Wiley Publishing Inc. Hoboken United States. 384 p. ISBN: 978-0470891919
2. Husen A. Mohammad J. 2020. Nanomaterials for Agriculture and Forestry applications. Elsevier-Academic Press. London. United Kingdom. 562 p. ISBN: 978-0128178522

3. Oprea A. E., Grumezescu A. M. 2017. Nanotechnology Applications in Food Flavor, Stability, Nutrition and Safety, Elsevier-academic press. London. United Kingdom. 416 p. ISBN: 978-0128119426

COMPLEMENTARY REFERENCES

1. Ranjan S. Dasgupta N. Lichtfouse E. 2017. Nanoscience in Food and Agriculture 4, Sustainable Agriculture Reviews book series (SARV volume 24). Springer Nature. Switzerland. 305 p. ISBN: 978-3319850658
2. Ramsden J.J., 2018, Applied Nanotechnology: The Conversion of Research Results to Products: A volume in Micro and Nano Technologies, Science Direct, 292 p. ISBN: 978-0128133439

RECURSOS WEB

1. Biblioteca digital de la universidad de Chile. Base de datos: <https://www.uchile.cl/portal/informacion-y-bibliotecas/servicios-de-biblioteca/bases-de-datos/57681/indice-por-titulo>
2. Biblioteca de la universidad de chile. Libros electrónicos: <https://www.uchile.cl/portal/informacion-y-bibliotecas/servicios-de-biblioteca/75613/libros-electronicos>
3. U Cursos <https://www.u-cursos.cl/>