## Project 2019-1-PL01-KA202-065885

The international education program in the field of precision farming as an opportunity to raise the efficiency of agricultural farms manage by young agro-technicians



"PRECISION FARMING"

LESSON PLANS

Projekt finansowany w ramach programu Unii Europejskiej Erasmus+
Project financed by



## **LESSON PLANS**

Number	Subject	Program of the	Methods and	Credit, learning,	Unit of	Assessment
of	of the lesson	lesson	tools	outcomes,	learning	
lesson				qualification	outcomes	
1.	Soil nutrients	Divide the class into 10 groups Have each group send a representative to get a carnation and a cup of water with food colouring. Explain that the lesson is on soil nutrients and each colour represents a different nutrient. Have the students put the carnation in the water and then set it aside until the end of class.  To start the class, the teacher will show the students how to set up the carnation in the food colouring and water. The teacher will use the PowerPoint and lecture to provide the students with the information.	PowerPoint presentation Handout of slides Hands on experiment Lecture Food colouring White carnations Paper cups Water	Know the definition of deficiency, nutrient, toxicity macronutrients, micronutrients, identify the plant deficiencies from pictures Evaluate a plant to identify the nutrient absorption rate	The monitoring of soil quality indicators	The teacher first covers the results of the carnation experiment. Showing how the different nutrients have different absorption rates. Each group shows their flower to the rest of the class. Then the teacher hands out envelopes containing a short memory game. The students identify and match the nutrient deficiency symptom to the nutrient. They will do it in the same groups as before.

2.	Microbiota	The teacher explain relations of organism in the life of soil from the kingdom of flora and fauna.  The importance of organisms in soil formation The teacher and students will interact through questions about the life of the soil, creatures, the trophic relationships and the trophic network of soil organisms The fauna in the soil is extremely rich (millions of individuals per square metre), but most species are extremely small in size.  Soil protozoa can be observed under a microscope	Observation, worksheets, brainstorming, pictures Methods of ecological research of zoonoses: - qualitative/quantitative study: terrestrial invertebrates -soil fauna- soil samples in the laboratory -fauna from soil level and from litter- barber traps, processed litter samples -fauna from soil level and the grass layer: the square method and the fascia method, invertebrates from various activity centres: brash, forceps, jar with preservative fluid and	The student will be able to define; identify the organisms in the soil Trophic relationships	The monitoring of soil quality indicators	Definition applied discussion Identification of organisms of soil and trophic relationships. Practical evaluation sheet
3.	Compost	Definition of compost,	exhaust.  Stellar explosion,	The students will be able	Compost	Definition
		importance, composition, role. The teacher uses a school composting DVD, telling a story related to the	brainstorming, practical activity, minicompost	to identify the natural materials for making a compost cell.		applied discussion Identification of natural materials from the school yard Composting

		composting process. The teacher explains and teaches about composting, talks about compost. With a power				Posters of different sizes and contents Campaign of home composting Tips for reducing waste in
		point presentation also explaining those educational activities. Lesson consists of				several aspects of our daily life
		technical aspects and information to improve composting practical				
		advise, applications of biowaste compost, description and results of a compost experiment				
4.	Sustainable	This lesson allows the	lecture	We are talking about	The monitoring	Formative, discussion
	development and	students to explore the	- case study	sustainability in the	of soil quality	questions:
	organic farming	many concepts of	- brainstorming	social sense	indicators	- Define "Sustainable
		Sustainable development		This is also what defines		development"
		and to develop in their		our key values:		- What is the difference
		own mind a definition of		sustainability, continuity		between Sustainable
		organic farming . Lesson		We considers it a		development and Organic
		consists of the lecture		fundamental strategy		Farming?
		"Importance of mapping		objective formation and		- How has Sustainability
		in organic farming for the		maintenance of a		made Organic Farming
		decision making".		sustainable development		Possible?
		The instructor and		system of the agriculture		- Discuss applications of
		students will interact to		sector		Sustainability in Organic
		answer questions about		Upon completion of this		Farming
		what is Sustainable		unit, the student will be		- Define Geographic
				able to:		Information Systems

		development and organic		- define organic farming,		- Explain the relationship
		farming and the uses of it		- explain the importance		between Sustainability and
		raining and the uses of it		of maps in Organic		Organic Farming
				Farming		- Provide examples of
				•		·
				<ul><li>define Sustainability</li><li>define Organic Farming</li></ul>		Sustainability/Organic
				•		Farming usage in other
				- analyse a diagram of		branches of industry
				the relationship between		
				Sustainability and		
				Organic Farming		
5.	Determining soil pH	This lesson will take the	Learning through	At the end of the activity,	Soil and crop	1. Define the pH of the soil.
	and its importance	form of a practical work	discovery	the students will be able	management to	2. Classify soils according to
	for plant growth	in nature and in the		to:	increase	pH.
	and development	biology laboratory and	Heuristic conversation	- define the pH of the	productivity in	3. Describe the
		will allow students to		soil;	agriculture.	characteristics of strongly
		understand the	Problem	-classify soils according		acidic soils.
		importance of soil pH for		to pH;		4. Characterize strongly
		the growth and	Remark	-describe the		alkaline soils.
		development of crop		characteristics of		5. Determine the pH of the
		plants.	Demonstration	strongly acidic soils;		soil samples collected.
		Students will take soil		-characterize strongly		6. Explain how the pH of the
		samples; with the help of		alkaline soils;		soil influences the growth
		the laboratory kit, they		-determine the pH of the		and development of crop
		will determine the soil pH		soil;		plants.
		and will be able to make		-interpret the result of		
		decisions about planting		the determination in		
		some species of		correlation with the		
		agricultural importance		growth and development		
		according to their		process of the culture		
		preferences for this		plants.		
		abiotic factor, pH.				

6.	Dotormining the	This lesson will take the	Loarning through	At the end of the activity,	Soil and crop	1. Define the soil texture.
б.	Determining the texture of the soil		Learning through	the students will be able	· ·	
		form of a practical work,	discovery		management to	2. Classify the soils by
	and its importance	in nature and in the		to: - define the soil	increase	texture.
	for the growth and	biology laboratory and	Heuristic conversation	texture; -classify soils by	productivity in	3. Describe the
	development of	will allow students to		texture; -describe the	agriculture.	characteristics of coarsely
	crop plants	understand the	Problem	characteristics of soils		textured soils.
		importance of soil texture		with a coarse texture; -		4. Characterize the soils with
		for the growth and	Remark	characterize soils with a		a medium texture;
		development of crop		medium texture; -		5. Describe the
		plants.	Demonstration	describe soils with a fine		characteristics of fine-
		Students will take soil		texture; -determine the		textured soils.
		samples; with the help of		texture of the soil; -		6. Determine the texture
		the laboratory kit, they		interpret the result of		of the collected soil samples.
		will determine the soil		the determination in		7. Explain how the texture
		texture and will be able		correlation with the		of the soil influences the
		to make decisions about		growth and development		growth and development
		planting species of		process of the culture		of crop plants.
		agricultural importance		plants.		
		depending on their				
		preferences for this				
		abiotic factor, soil				
		texture.				
7.	Interpretation of	This lesson can be carried	Learning through	a. Interpretation of the	Soil surveillance	1.Determine the mineral
	soil characteristics	out in a specialized	discovery	phenomenon of	and control	part of the soil.
		laboratory and includes		formation of the mineral		2.Interpret the phenomenon
		the following activities:	Heuristic conversation	part of the soil -		of formation of the organic
		Interpretation of the		processes of		part of the soil.
1		phenomenon of	Problem	disaggregation and		3.Identify the main soil
1		formation of the mineral		alteration, mineralogical		types.
1		part of the soil	Remark	composition, magmatic,		
1		Interpretation of the		metamorphic,		
1		phenomenon of		sedimentary rocks;		
		· ·				

		formation of the organic		b. Interpretation of the		
		part of the soil.		phenomenon of		
		Identification of the main		formation of the organic		
		soil types		part of the soil -		
		Correlation between		decomposition of organic		
		living organisms in the		residues by hydrolysis,		
		soil and its properties		oxidation-reduction and		
				total mineralization and		
				humus formation		
				c. Identification of the		
				main types of soil:		
				chernozem, reddish		
				brown, brown, podzol,		
				solonetz, solonchak,		
				alluvial soil, peat soil;		
				d. Correlation between		
				soil organisms and their		
				properties: frame-		
				fertility		
8.	Determine the	This lesson can be carried	Learning by doing	At the end of the class,	Soil surveillance	1.What is the sample's
	physical	out in a specialized	Learning through	the students will be able:	and control	humidity?
	characteristics of	laboratory and includes	discovery	-to determine the soil		2. Describe the soil capillarity
	the soil	the following activities:		moisture, according to		3.Identify soil density and
		Determination of soil	Heuristic conversation	the performance		bulk density
		moisture		criterion		
		Determination of particle	Problem	- to determine the		
		size composition and soil		particle size composition		
		texture	Remark	and soil texture		
		Determination of soil		- to determine the		
		capillarity		capillarity of the soil,		
		Determination of soil		according to the		
		density and bulk density		performance criterion		

				- to determine the density and the apparent density of the soil		
9.	Determine the chemical indicators of soil quality	The lesson takes place in a specialized laboratory and involves completing the following activities: Collection of soil samples with specific tools Preparation of the sample collection form Determination of soil reaction Determination of soil saturation with chemical fertilizers Determining the degree of soil infestation with pesticides Quantitative determination of microelements and secondary elements in the soil Interpretation of the results	Learning by doing Learning through discovery  Heuristic conversation  Problem  Remark	At the end of the class, the student will be able:  - to collect soil samples, according to the performance criterion  - to draw up the sample collection form  - to determine the reaction of the soil  - to determine the degree of soil saturation with chemical fertilizers  - to determine the degree of infestation of the soil with pesticides  - to determine quantitatively the microelements and the secondary elements in the soil  - to interpret the results of the determinations	Soil surveillance and control	Determination of chemical soil quality indicators: Soil samples: simple, medium, deep, surface Collection form: name and surname of the person collecting the samples, date and time of sampling, place of collection of samples, type of sample, weather conditions at the time of collection, the purpose of collection Instruments: agrochemical probe Soil reaction: pH, alkalinity, acidity Chemical fertilizers: nitrogen, total phosphorus, potassium Microelements: Mn Secondary elements: Ca, Mg, Fe Interpretation: quality indicators
10.	Determine the microbiological indicators of the soil	The lesson will take place in a specialized laboratory and includes the following stages:	Learning by doing Learning through discovery	At the end of the class, the students will be able: - to prepare specific instruments and	Soil surveillance and control	Work tasks:  Determination of soil  microbiological indicators

		Preparation of specific	Heuristic conversation	equipment for the		-Prepares: sterilization with
		instruments and	rieuristic conversation	collection of samples and		solutions, by buckling,
		equipment for sampling	Problem	the microbiological		heating to red, in autoclave
		and the microbiological	FIODIEIII	analysis		- Samples: simple, medium,
		_	Domark	- to collect soil samples,		
		analysis	Remark	· ·		surface, deep
		Collection of soil samples		according to the		- Instruments: agrochemical
		with specific tools		performance criterion		probe
		Preparation of the		- to draw up the soil		- Collection form: name and
		sample collection sheet		samples collection form		surname of the person
		Determination of		- to determine the		collecting the sample, date
		microorganisms		microorganisms in the		and time of collection, place
		Interpretation of the		soil, according to the		of collection, type of sample,
		results		performance criteria		weather conditions at the
				- to interpret the results		time of collection, the
				of the microbiological		purpose of collection
				analysis		-Microorganisms: bacteria,
						fungi
						- Interpretation: soil quality
						indicators
11.	Determine the	This lesson will take place	Learning by doing	At the end of the class,	Soil surveillance	What is the harvest depth?
	radioactivity of the	outdoors, in nature, on	Learning through	the students will be able:	and control	What is used to collect soil
	soil	different plots that we	discovery	- to collect soil samples,		samples?
		want to analyse:		according to the		Describe the Scintillation
		Collect soil samples	Heuristic conversation	performance criterion		Detector.
		Measures soil		- to measure the		
		radioactivity with special	Problem	radioactivity of the soil,		
		devices		according to the		
		Monitor and interpret the	Remark	performance criterion		
		results of determinations		- to monitor and		
				interpret the results of		
				the determinations		

12.	Segmentation	In light of the increasing	Lecture	At the end of this lesson,	Management of	Students will be segmenting
	algorithm	demand for food	Description	the students will:	zones	different plots of land
		production, climate	Learning through	- be aware of the		
		change challenges for	discovery	segmentation algorithm;		
		agriculture, and the		- know the steps of the		
		economic pressure,	Heuristic conversation	workflow;		
		precision farming is an		- be able to overcome		
		ever-growing market.	Problem	the difficulties of using		
				vegetation indices for		
		For the automatic	Remark	segmentation		
		delineation of MZ, a				
		segmentation algorithm				
		was developed based on				
		RapidEye satellite images.				
		The workflow was divided				
		into three steps: (a)				
		automatic selection of				
		suitable satellite images				
		which reflect crop				
		patterns, (b) combining				
		the NIR bands of all				
		selected images to one				
		averaged raster and				
		dividing the result into				
		five classes, (c) conversion				
		into vector data and				
		assignment to areas of				
		relative yield expectation				
		(corresponding to MZ).				
		Detailed information on				
		these steps is provided				
		below.				

		Before the selection				
		process, every image was				
		clipped to the extent of				
		the field 100-01, including				
		a negative buffer of 18 m				
		to exclude margin				
		artefacts, especially in the				
		area of headland.				
		The algorithm was				
		programmed in R (R Core				
		Team 2012) with the use				
		of the packages 'raster',				
		'maptools', 'stringr',				
		'rgeos', 'diptest' and				
		'moments'.				
13.	Improving water	The lesson teaches	lecture	Upon completion of this	Exploring	Formative, discussion
	use efficiency	students how precision	case study	unit, the student will be	options for	questions:
	(WUE), Nitrogen	agriculture uses	brainstorming	able to:	improving water,	- What are the options for
	use efficiency	geographic information	GIS	-Explain the	nitrogen and	increasing yield, WUE and
	(NUE), and	systems (GIS) to help	GPS	definitions of water	radiation use	NUE in a rainfed dryland
	Radiation use	farmers and		and nitrogen, and	efficiency in crop	system?
	efficiency (RUE) in	manufacturers make		radiation use	production	- What are the effects of
	field crops	smart, efficient, and		efficiencies	system	long-term applications of soil
		responsible decisions		-Find the interactions		organic amendments and
		about how and when		between water and		mineral fertilizers on crop
		they plant, grow, irrigate,		nitrogen in crop		yields, WUE and NUE in a
		harvest, and transport		production		rainfed dryland system?
		crops.		-Describe the		- What are the potentials of
		The lesson consists of the		importance of		increasing WUE and NUE in
		lecture "Improving Water		improving water and		orange production?
		Use Efficiency, Nitrogen				

Use I	Efficiency, And	efficiency in crop	- What are the possible
Radia	iation Use Efficiency	production	fertigation strategies for
In Fie	ield Crops"	-Calculate water use	improving WUE and NUE in
		efficiency (WUE),	orange production?
		Nitrogen use	
		efficiency (NUE), and	
		Radiation use	
		efficiency (RUE)	
		-Name water and	
		nitrogen saving	
		techniques	
		-Explain the role of	
		long-term field	
		monitoring studies	
		-define GIS	
		-explain the role of	
		soil-crop modelling	

14.	Improving water	The teacher starts the	Lecture	The student will be able	To increase	Formative, discussion
	use efficiency	lesson with a short	Presentation	to:	awareness about	questions:
	(WUE) in climate	presentation which	Work in groups	- define water use	climate change	-Why is water use efficiency
	changing conditions	contains many photos		efficiency		important?
		which illustrate the		- calculate water use		- How water use efficiency
		consequence of climate		efficiency (WUE)		can be improved in the
		change. The teacher also		- name four factors		climate change conditions?
		prepares a lecture		changing in the climate		What are the main problems
		"Water use efficiency in		that will affect water		in the process of improving
		response to climate		use by plants		water use efficiency?
		change" in which he or		- explain the		- Which crop has the highest
		she explains that water		consequence of climate		water use efficiency?
		use efficiency (WUE) is		change.		
		the most important		- find links between		
		characteristic of		climate change and		
		ecosystem productivity,		water use efficiency		
		which links carbon (C)				
		and water cycling.				
		The last part of the lesson				
		is work in groups: each				
		group will receive a				
		problem related to the				
		lesson's topic.				
15.	Improving water	The lesson consists of a	Lecture	The students will be able	To increase	Formative, discussion
	use efficiency:	lecture about the	Tree of terms	to:	awareness about	questions:
	Agronomic	agronomic perspective	Debates	- explain the importance	water use	- What is water use
	perspective.	and irrigation		of water use efficiency.	efficiency in	efficiency in agriculture?
	Irrigation	management practices of		- calculate water use	agriculture	-Which crop has the lowest
	management	improving water use		efficiency (WUE) in		water use efficiency?
	practices	efficiency. Also the		agriculture		- Explain the role of the
		teacher and the students		-define the irrigation		irrigation system in
		create a tree of terms		system		

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		which they will use		-make examples of		improving water use
		during the lesson. In fact,		irrigation management in		efficiency
		agriculture is the largest		different countries		- what are the pros and the
		consumer of water.		-explain the differences		cons of irrigation
		The last part of the lesson		between drip irrigation		management practices
		are debates on the		and raised bed irrigation		-what is the best
		suggested topic about		- explain which of the		implementing practice of
		the pros and the cons of		types of irrigation		irrigation management?
		irrigation management		practices are the more		Why?
		practices		effective		
16.	Agronomic and soil	This lesson allows the	lecture	Upon completion of this	Soil and crop	Formative, discussion
	management	students to explore many	case study	unit, the student will be	management to	questions:
	practices	agronomic and soil	presentation	able to:	increase	- What is sustainable
		management practices.	video materials	- define soil erosion, soil	productivity in	development?
		The lesson consists of a	brainstorming	fertility, climate change.	agriculture	- What is the difference
		lecture, practical tasks		-name the major		between sustainable
		and a presentation about		environmental problem		development and organic
		soil erosion, loss of soil		-explain the term		farming?
		fertility, and land		'sustainable		-what are the ways of solving
		degradation due to		development'		soil erosion, loss of soil
		climate change as the		-make examples which		fertility, and land
		major environmental		illustrate the results of		degradation.
		problem, video materials		successful		- analyse partner countries'
		about Ethiopian		implementation of the		experience with soil
		experience with soil		practices.		management practice
		management practice.		ľ		,
		At the end of the lesson,				
		there will be				
		brainstorming.				
17.	Biochemical	The teacher starts the	Learning through	The students will be able	Exploring	Question for discussion:
1/.	alterations and	lesson with the heuristic	<b>.</b> .	to:	options for	Question for discussion.
	aiterations and	lesson with the neuristic	discovery	ιυ.	υμιίστις τοι	

	stomatal	conversation with which		-define the terms	biochemical	-What are biochemical
	physiology.	students will be able to	Heuristic conversation	biochemical alteration,	alterations and	alterations?
	Alteration of	find right answers that		stomatal physiology,	stomatal	- What is the physiology of a
	cropping	the lead to topic of the	Problem solving	harvest index	physiology	plant?
	environment, root	lesson. Next, the teacher		-calculate the harvest		- What is the role of plant
	architecture, and	explains the lecture	Practical task	index		physiology in agriculture?
	improved harvest	about alteration of		-explain the physiological		- analyse one of the crop
	index	cropping environment,		basis of stomatal		management techniques to
		root architecture, and		response		enhance the harvest index
		improved harvest index.		- understand three		- How are crops affected by
		After that, the students		functions of stomata		climate change?
		are provided with a		- know the Father of		-How can we adapt crops
		problem related to the		Plant Physiology		and cropping systems to
		topic. They should solve it		- explain crop modelling		climate change?
		with their acquired skills		- define root system		
		and knowledge from the		architecture and know all		
		lesson.		types of it		
18.	The importance of	This lessons provides	Lecture with slides	Students will be able:	The increase of	Questions for a discussion:
	improving nitrogen	information about the	Cooperative learning	- to explain the	the use of	- What is Nitrogen?
	use efficiency in	significant role of	Brainstorming	importance of Nitrogen	Nitrogen	- What is the role of Nitrogen
	crop plants	Nitrogen in farming. In		in farming;	fertilizers in	in farming?
		fact, Nitrogen (N) is the		- to discuss examples of	agriculture has a	- Describe the Nitrogen
		most critical externally		improving nitrogen use	crucial impact on	cycling in nature.
		added input for any crop		efficiency in crop plants	the diversity and	- Which factors influence
		production system. The		in different countries;	functioning of	nitrogen use efficiency?
		lesson consists of tree		- to know different	the non-	- How many strategies for
		parts. The first one is a		strategies for nitrogen	agricultural	nitrogen use efficiency do
		lecture "The importance		use efficiency.	neighbouring	you know? Describe one of
		of improving nitrogen use			bacterial, animal,	them.
		efficiency in crop plants".			plant	- Which country has the best
		The second one are the			ecosystems.	experience of improving

		practical exercises related			The use of	nitrogen use efficiency in
1 1		to the following topic in			Nitrogen has	crop plants? Explain your
1 1		<u> </u>			also increased	opinion.
1 1		groups of 3-5 students.				opinion.
1 1		And, finally, the last one			the quantity of	
1 1		is brainstorming: the			agricultural food	
1 1		teacher introduces an			production.	
1 1		issue and asks the				
1 1		students to reach a				
1 1		conclusion on their own.				
1 1		The teacher, of course,				
1 1		moderates the whole				
		process.				
19.	Improving nitrogen	This lesson can be carried	Learning through	a. Interpretation of the	Soil surveillance	1.Determine the mineral
1 1	use efficiency:	out in a specialized	discovery	phenomenon of	and control	part of the soil.
	Agronomic	laboratory and includes		formation of the mineral		2.Interpret the phenomenon
1 1	perspective	the following activities:	Heuristic conversation	part of the soil -		of formation of the organic
	(Rotation, Irrigation	Interpretation of the		processes of		part of the soil.
	management)	phenomenon of	Problem	disaggregation and		3.Identify the main soil
		formation of the mineral		alteration, mineralogical		types.
		part of the soil	Remark	composition, magmatic,		
		Interpretation of the		metamorphic,		
		phenomenon of		sedimentary rocks;		
		formation of the organic		b. Interpretation of the		
		part of the soil.		phenomenon of		
		Identification of the main		formation of the organic		
		soil types		part of the soil -		
		Correlation between		decomposition of organic		
		living organisms in the		residues by hydrolysis,		
		soil and its properties		oxidation-reduction and		
		1 -1		total mineralization and		
				humus formation		

20.	Nitrogen source and placement method. Precision agriculture and management practices	This lesson can be carried out in a specialized laboratory and includes the following activities: Determination of soil moisture Determination of particle size composition and soil texture Determination of soil capillarity Determination of soil density and bulk density	Learning by doing Learning through discovery Heuristic conversation Problem Remark	c. Identification of the main types of soil: chernozem, reddish brown, brown, podzol, solonetz, solonchak, alluvial soil, peat soil; d. Correlation between soil organisms and their properties: framefertility  At the end of the class, the students will be able: to determine the soil moisture, according to the performance criterion to determine the particle size composition and soil texture to determine the capillarity of the soil, according to the performance criterion	Soil surveillance and control	1.What is the sample's humidity? 2. Describe the soil capillarity 3.Identify soil density and bulk density
		density and bulk density		-		
21.	Improving nitrogen use efficiency: Physiological perspective	The lesson takes place in a specialized laboratory and involves completing the following activities: Collection of soil samples with specific tools	Learning by doing Learning through discovery Heuristic conversation	At the end of this lesson, the students will be able: - to collect soil samples, according to the performance criterion	Soil surveillance and control	Determination of chemical soil quality indicators: Soil samples: simple, medium, deep, surface Collection form: name and surname of the person

		Preparation of the	Problem	- to draw up the sample		collecting the samples, date
		sample collection form		collection form		and time of sampling, place
		Determination of soil	Remark	- determine the reaction		of collection of samples, type
		reaction		of the soil		of sample, weather
		Determination of soil		- to determine the		conditions at the time of
		saturation with chemical		degree of soil saturation		collection, the purpose of
		fertilizers		with chemical fertilizers		collection
		Determining the degree		- to determine the		Instruments: agrochemical
		of soil infestation with		degree of infestation of		probe
		pesticides		the soil with pesticides		Soil reaction: pH, alkalinity,
		Quantitative		- to determine		acidity
		determination of		quantitatively the		Chemical fertilizers:
		microelements and		microelements and the		nitrogen, total phosphorus,
		secondary elements in		secondary elements in		potassium
		the soil		the soil		Microelements: Mn
		Interpretation of the		- to interpret the results		Secondary elements: Ca, Mg,
		results		of the determinations		Fe
						Interpretation: quality
						indicators
22.	Definition of	The lesson will take place	Learning by doing	At the end of the class,	Soil surveillance	Work tasks:
	Radiation use	in a specialized	Learning through	the students will be able:	and control	Determination of soil
	efficiency (RUE)	laboratory and includes	discovery	- to prepare specific		microbiological indicators
		the following stages:		instruments and		
		Preparation of specific	Heuristic conversation	equipment for the		-Prepares: sterilization with
		instruments and		collection of samples and		solutions, by buckling,
		equipment for sampling		the microbiological		heating to red, in autoclave
		and microbiological		analysis		- Samples: simple, medium,
		analysis		- to collect soil samples,		surface, deep
		Collection of soil samples		according to the		- Instruments: agrochemical
		with specific tools		performance criterion		probe
				■		
		Preparation of the		- to draw up the soil		- Collection form: name and

	1				ı	
		Determination of		- to determine the		collecting the sample, date
		microorganisms		microorganisms in the		and time of collection, place
		Interpretation of the		soil, according to the		of collection, type of sample,
		results		performance criteria		weather conditions at the
				- to interpret the results		time of collection, the
				of the microbiological		purpose of collection
				analysis		-Microorganisms: bacteria,
						fungi
						- Interpretation: soil quality
						indicators
23.	Improving radiation	This lesson will take place	Learning by doing	At the end of the class,	Soil surveillance	Formative, discussion
	use efficiency:	outdoors, in nature, on	Learning through	the students will be able:	and control	questions:
	agronomic	different plots that we	discovery	- to collect soil samples,		What is the harvest depth?
	perspective	want to analyse:		according to the		What is used to collect soil
		Collect soil samples	Heuristic conversation	performance criterion		samples?
		Measure soil radioactivity		- to measure the		Describe the Scintillation
		with special devices	Problem	radioactivity of the soil,		Detector.
		Monitor and interpret the		according to the		
		results of determinations	Remark	performance criterion		
				- to monitor and		
				interpret the results of		
				the determinations		
24.	Relationship	The lesson teaches	- lecture	Upon completion of this	Exploring	Formative, discussion
	between water use	students how precision	- case study	unit, the student will be	options for	questions:
	efficiency, nitrogen	agriculture uses	- brainstorming	able to:	improving water,	- What career could you
	use efficiency, and	geographic information	-GIS	- Define water and N use	radiation and	choose that uses these skills
	radiation use	systems (GIS) to help	-GPS	efficiencies	nitrogen use	to develop instruments used
	efficiency under	farmers and		- define Radiation Use	efficiency in crop	in precision agriculture?
	water-deficit	manufacturers make		Efficiency	production	- Why is precision agriculture
	conditions	smart, efficient, and		- Explain the interactions	system	important?
		responsible decisions		between water and		
		about how and when				

		they plant, grow, irrigate, harvest, and transport crops The lesson consists of a lecture "Improving Water Use Efficiency, Nitrogen Use Efficiency, And		nitrogen in crop production - Explain water and nitrogen use efficiency in crop production - List water and nitrogen saving techniques		<ul> <li>What are the effects of soil mulching on yields, WUE and NUE?</li> <li>What are the options for increasing yield, WUE and NUE in a rainfed dryland system?</li> </ul>
		Radiation Use Efficiency In Field Crops Under Drought Stress"		- Understand the role of long-term field monitoring studies - define GIS - Understand the role of soil-crop modelling		- What are the effects of long-term applications of soil organic amendments and mineral fertilizers on crop yields, WUE and NUE in a rainfed dryland system?
25. 26.	PRECISION AGRICULTURE  Definition of Precision Agriculture  The Importance of Maps in Precision Agriculture  The Importance of Mapping in Data Acquisition in Precision	This course enables students to explore many concepts of precision agriculture and develop a definition of Precision Farming on their own. The course consists of "Precision Agriculture and the Importance of Mapping in Decision Making in Agriculture".	Lecture, Practice, Brainstorming, Group Work, Textbook, Computer, Smart Board, Educational CDs, Simulations, Auxiliary Resources	Define precision agriculture. Explain the importance of maps in precision agriculture.	Soil and crop management to conserve food and increase food security	Define "Precision Farming". What is the difference between precision agriculture and traditional agriculture?
	Agricultural Technology					

28. Precision agriculture and what Use of GIS in Precision agriculture and what Traditional farming is and Precision Agriculture. Agriculture and what Traditional farming is and Precision Agriculture. Agriculture and what Traditional farming is and Precision Agriculture. Agriculture and what Traditional farming is and Precision Agriculture. Agriculture and what Traditional farming is and Precision Agriculture. Agriculture							
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	Water Resources	Management and The	CDs, Simulations,	agriculture.	food security	Fisheries? How should Water
	Management and	Use of Technology in	Auxiliary Resources	a Grandar an	,	Resources Management be
	The Use of	Fisheries and Water	, , , , , , , , , , , , , , , , , , , ,			done?
	Technology in	Resources Management.				45.161
	Fisheries	The section of the se				
	Water Resources					
	Management					
35.	Use of Technology	The instructors and	Lecture, Practice,	Understand the	Soil and plant	How to use Technology in
36.	in Fishing	students will interact to	Brainstorming, Group	importance of following	management to	Fishing? What are the
		answer questions about	Work, Textbook,	technological	increase food	developments in Technology
	Use of Technology	the Use of Technology in	Computer, Smart	developments in	conservation and	Usage in the Food Industry?
	in the Food	Fishing and Food	Board, Educational	agriculture.	food security	
	Industry	Industry.	CDs, Simulations,			
			Auxiliary Resources			
37.	Wireless Sensor	This lesson allows the	- lecture	Upon completion of this	- WSNs	Formative, discussion
	Networks and their	students to understand	- case study	unit, the student will be	topologies;	questions:
	Applications	the essence of the	- brainstorming	able to:	- classification of	- What sort of device is
		structure of WSNs, their		- define Wireless Sensor	WSNs topologies	WSN? Why has this technical
		main types, the fields and		Networks;	(depending on	tool acquired such a
		areas of their application,		<ul> <li>explain the various</li> </ul>	the	popularity recently? What
		as well as what are the		topologies of WSNs;	environment);	needs does it meet in the
		limitations of these		- define the classification	- limitations of	modern society?
		applications. The lesson		of WSNs, depending on	WSNs;	- Describe the main
		consists of a lecture		the environment;	- WSNs	constituting parts of a WSN
		"Wireless Sensor		- explain and understand	applications.	and say what their functions
		Networks and their		the limitations of WSNs;		are.
		Applications -		- define and explain the		- What are the main types of
		Introduction". The		various applications of		WSNs deployed, depending
		instructor and students		WSNs.		on the environment? Which

38. Main groups of	questions about what are Wireless Sensor Networks and where and how they are used.  This lesson allows the	- lecture	Upon completion of this	- Types of	one is the most popular according to you and why? - Which of all limitations of WSNs is, in your opinion, the most difficult to overcome? Why? - In your opinion, which of all applications of WSNs is the most important and why? Formative, discussion
sensors in accordance with their operational disposition; Wireless Sensors application in Precision Agriculture	students to realize the important role, allotted to sensors in precision agriculture and to get acquainted with their functions and types. The lesson consists of a lecture "Wireless Sensors Open a Gateway to Smart Farming".  The instructor and students will interact to answer questions about the three main functions of sensors within a system: 1.monitoring and control, 2. security and warning, and 3. diagnosis and analysis.	- case study - brainstorming	unit, the student will be able to: - define the main types of sensors; - explain their functions; - describe their specific applications; - explain the principles of their operation; - present their classification in the form of a flow chart or a block scheme.	sensors; - Principles of their operation; - Classification of sensors; - Practical benefits as a result of the application of wireless sensors in agriculture; - Specific areas of application of wireless sensors.	questions: - What sort of a device is a sensor? - What is the function of the wireless sensor nod? - What physical properties of the soil can sensors in WSNs measure? - What are the three main functions of a sensor in WSNs? - How many groups of wireless sensors are there according to their general functions? - What is the operation principle of a wireless sensor nod? - How can sensors, including the wireless ones, help the

						- How do you understand the
						phrase at the end of the text
						that "prevention is better
						than cure" and what is the
						role of wireless sensors in
						this strategy?
39.	Wireless Sensor	This lesson allows the	- lecture	Upon completion of this	The Role of WSN	Formative, discussion
	Network (WSN) and	students to understand	- case study	unit, the students will be	and IoT in	questions:
	Internet of Things	how the concepts	- brainstorming	able to:	relation to	- How do WSNs collect
	(IoT) in Precision	'Wireless Sensor		- describe the WSN and	Precision	information?
	Agriculture;	Network'(WSN) and		IoT technologies	Agriculture; The	- What is the IoT
	The characteristics,	'Internet of Things'(IoT)		- explain the work of the	Structure and	environment composed of?
	the architecture	can support the		of multiple Sensor Nodes	application of	- Which part of Wireless
	and application of	contemporary		in a wireless	WSNs;	Sensor Networks enables
	WSN and IoT.	agriculture. To explain,		communication-based	The way of	detecting of physical
		how these technologies		environment	working of the	phenomena such as
		can be applied in		- state the components	Sensor Nodes;	temperature, humidity, and
		practice, a 'Proposed		and characteristics of	IoT practical	moisture with limited energy
		System' architecture is		wireless Sensor Nodes	application in	and memory?
		introduced.		- give examples of WSNs	Agriculture	- What are the application
		The lesson consists of a		application areas in		areas of WSNs? Provide
		lecture: "Wireless Sensor		relation to agriculture		examples.
		Network and Internet of		- define the structure of		- Which are the main
		Things in Precision		IoT		components of a Sensor
		Agriculture".		-explain how IoT increase		Node?
		The instructor and		productivity and reduce		- How can farmers collect
		students will interact to		costs		such data as: temperature,
		answer questions about				air humidity, soil humidity,
		the structure of WSNs				volumetric water content
		and how IoT is designed.				unit (VWC) and gravimetric
		Also, the students will be				water content (GWC)?
		able to provide examples				

collect mUA' (microphics Aeria based Sensia Multi moni	information ction; study varies of Unmanned appeared WSNs or Networks ); less or Networks ); V-based RS or Unmanned all Vehicle - do Remote all vehicl	udents to explore rious technologies and plications that improve e field information llection method. The son consists of a cture "Field information llection: An air-ground ulti-sensor monitoring stem". The instructor d students will interact answer questions out The existing enefits and limitations WSNs, RS, mUAV-sed WSNs and mUAV-based RS.	- lecture - case study - brainstorming	Upon completion of this unit, the student will be able to: - describe WSNs in terms of real-time agricultural environment monitoring, - explain mUAV-based WSNs systems in agricultural applications, their benefits and limitations; - define mUAV-based RS systems and state their benefits and limitations - define an air-ground multi-sensor monitoring system  Upon completion of this	Various techniques and applications to obtain field information, increase the production and optimize the overall farming practices	communication standards such as Wi-Fi, low-power Bluetooth, NFC, RFID? - In which areas can IoT be applied? Formative, discussion questions: - What are the limitations and benefits of classic WSNs? - What is the communication workflow in mUAV-based WSNs architecture? - What are the limitations and benefits of mUAV-based WSNs? - What are mUAV-based RS systems? - What are the limitations and benefits of mUAV-based RS? - What systems does an airground multi-sensor monitoring system combine?
	less Sensors stru	·	- case study - brainstorming	unit, the student will be able to:	elements of the monitoring system, based on	questions: - In what respect is IOT of crucial significance to

1		which applies Wireless		- define the constituting	Wireless Sensors	precision agriculture
		Sensors Network and to		elements of the Crop	Network;	nowadays?
		acquire understanding of		Monitoring System;	- the function of	- What are the main
1		its constituting elements,		- explain their function;	the various types	elements of the crop
		their roles and functions.		- describe the	of sensors and	monitoring hardware
		The lesson consists of a		architecture of the	principles of	platform?
		lecture "Crop Monitoring		hardware platform;	their work.	- What parameters does the
		System based on Wireless		- explain the circuit of	- The application	environmental parameter
		Sensors Network".		sensor control matrix;	of Internet of	acquisition platform collect?
		The instructor and		- describe the	Things (IOT) in	- What are the requirements
		students will interact to		architecture of operating	precision	to the design of the
		answer questions about		system;	agriculture.	hardware platform?
		the essence of the system		- explain the operation of		- How many parts are there
		in question, its practical		applied types of nodes.		in the crop monitoring
		significance and				network system?
		application.				- What does the system
						kernel provide?
						- What tasks does the
						system software include?
						- How many types of nodes
						are implemented in the
						system? How do they
						function?
42.	Wireless Sensor	This lesson allows the	- lecture	Upon completion of this	The outside	Task 1. Answer the questions
	Networks	students to learn about	- case study	unit, the student will be	sensor -	to the text of the lesson.
	for Greenhouse	the use of Wireless	- brainstorming	able to:	designed for	1. What sort of devices are
	(Parameter Control	Sensor Networks in green		- define Remote	collecting	Wireless sensor nodes?
	) - Part I	house technology as part		Application Server (RAS);	information	What is their function?
		of Precision Agriculture.		-explain the Wireless	about the	3. What levels of networking
		The lesson consists of a		sensors and smart	outside climate	are used when a large
		lecture "Wireless Sensor		transducers;	of the green	number of sensors are
		Networks			house, such as	
		lecture "Wireless Sensor			of the green	-

	I	for grouphouse	dofino Wiroloss	Tomporatura	sonnostod wirolossly for
		for greenhouse	- define Wireless	Temperature,	connected wirelessly for
		parameter control".	communication	Pressure, Light,	greenhouse control?
		The instructor and	protocols, such as	Humidity, CO2,	4. When is a ZigBee sensor
		students will interact to	802.11, 802.15.4 and	Wind speed and	network used? And when a
		answer questions about	802.15.5	wind direction.	Remote Application Server
		what GREEN HOUSE is –	- define Sensors based	All these	(RAS)?
		an upcoming technology	on time-domain	parameters	5. What systems of wireless
		in precision agriculture,	reflectometer (TDR)	provide	sensors are used in a typical
		which helps farmers to		information	Precision Agriculture model
		grow a high-quality crop.		about the	of a green house? What is
		Special attention is paid		climate of the	the function of each one?
		to the application of		outside world.	6. How are the sensor nodes
		Wireless Sensor			classified? Explain the
		Networks, which play a			characteristics of each class.
		vital role in this			7. What is the main objective
		technology.			of a WSN system in Precision
					Agriculture?
					8. What sort of information
					does an outside sensor
					collect?
					9. Why is it necessary to
					monitor outside wind
					direction and wind flow in a
					typical green house control
					system?
					10. How are soil sensors
					placed in respect to their
					density? What sort of
					information are they
					expected to collect?
					chipotica to concer.
					Task 2. Questions for
					discussion.
					discussion.

						1. Compare the green house method of growing crops with the traditional ones. What are the advantages and disadvantages according to you.  2. In what way the application of WSNs for green-house growing of crops reflects the digital reality nowadays?  3. What, according to you, is the economic and social effect of the application of WSNs for the green house method of growing crops?  4. What do you think, which of all types of sensors, listed in the text, are the most important? Why?
43.	Wireless Sensor Networks for Greenhouse (Types of Sensors and Controlling Parameters) - Part II	This lesson allows the students to become acquainted with three types of sensors: Sensor node 'A' which is an outside climate sensor,	<ul><li>lecture</li><li>case study</li><li>brainstorming</li></ul>	Upon completion of this unit, the student will be able to: - define Air Temperature Control; -explain the Humidity	The greenhouse control is an event-based control system with a level crossing	Formative, discussion questions:  - What is the function of each of the three types of sensors, applied in a green house?
		Sensor node 'B', which is an inside climate sensor, Soil sensor node type 'C' to monitor the soil conditions.		Control - define Soil Condition Control.	sampling technique. In this system, control is executed in an	<ul> <li>What are the requirements about the minimum size of each parameter value?</li> <li>What is necessary to be done to the temperature</li> </ul>

	ı					
		The lesson consists of a			asynchronous	rate in both the diurnal and
		lecture "Types of Sensors			way through the	nocturnal state?
		and Controlling			use of three	- Temperature and humidity
		Parameters in a Green			types of sensors.	are controlled by the same
		House".				actuators. Which of the two
		The instructor and				factors is given priority and
		students will interact to				why?
		answer questions about				- Why is the monitoring and
		WSNs to analyse the				control of soil condition of
		diurnal and nocturnal				specific interest? What are
		parameter control with				the key parameters in this
		natural ventilation,				respect?
		heating systems, screen				- How many parts are there
		control and sprinkler				in an event-based
		control as a primary				controller? What are their
		control objective.				functions?
						- How can economical
						wireless sensor nodes be
						developed for some
						parameters of the green
						house?
44.	Hog Farm Control	This lesson allows the	- lecture	Upon completion of this	Hog farm system	Formative, discussion
	System Using	students to understand	- case study	unit, the students will be	structure and	questions:
	Wireless Sensor	that monitoring and	- brainstorming	able to:	evaluation of	- What sort of information
	Networks for	control of the quality of		- define the	animal welfare	should an ubiquitous hog
	Environmental	an indoor environment is		environmental factors,	by wireless	farm system collect and
	Monitoring and	of crucial importance for		considered by the	monitoring;	monitor?
	Facilities Control	animal health and		systematic management	Management of	- In respect to the system
		welfare and directly		of a hog farm;	a hog farm	architecture, how many
		impacts productivity and		- explain the importance	indoor	stages shall be there in the
		quality. One of the ways		of environmental	environment;	proposed ubiquitous hog
		to accomplish evaluation		sensors;	the specific	farm system?
	-	-				

		of animal welfare is by wireless monitoring. The lesson consists of a lecture "Hog Farm System Using Wireless Sensor Networks for Environmental Monitoring and Facilities Control". The instructor and students will interact to answer questions about what is Environmental Monitoring and Facilities Control in relation to a hog farm and the uses of Wireless Sensor Networks to achieve it.		- define the various layers of a hog farm control system and the correspondent types of sensors; - describe diagrams about the hog farm system architecture describe a hardware scheme of data acquisition and facilities control.	application of wireless sensor networks for this purpose.	- How many layers is each stage/class composed of? What are they? What is the function of each layer? - What are the main elements of each layer? What is their function? - What sort of devices does the hog farm control facility consist of? - What are the main functions of the Application layer? - How many sub-layers are there in the middle layer? - Which layer provides users with the hog farm monitoring service, the hog farm facility control service, pig history management services and situation notice services, etc.?
45.	Implementation of Wireless Sensor Networks with a herd management system	This lesson allows the students to explore the phases of functioning of WSNs with herd management and to understand the mechanism of work of	- lecture - case study - brainstorming	Upon completion of this unit, the student will be able to: - explain the use of WSNs in herd management for data collecting; - understand, explain and describe flow charts	Application of Wireless Sensor Networks in the cattle monitoring system for: - wireless communications;	Formative, discussion questions: - What sort of challenges could arise in the application of Wireless Sensor nodes in the cattle monitoring system?

	sensor nodes in this	diagrams in relation to	- receiving data	- What are the advantages in
	specific application.	data collecting;	about cattle	attaching two antennas to
	The lesson consists of a	- analyse diagrams about	mobility;	the collar of the animal?
	lecture "Implementation	sensor node operational	- creating a	- What question does the
	of Wireless Sensor	protocols;	dynamic routing	breaking up of a herd rise in
	Networks with a herd	- define the phases of the	scheme.	relation to the function of
	management system".	proposed Implicit		WSNs?
	The instructor and	Routing Protocol (IRP).		- Why does the behaviour of
	students will interact to			a herd need to be modelled
	answer questions about			in order to obtain a better
	what is cattle monitoring			function of WSNs?
	and how and why are			- What elements determine
	WSNs recommended to			the radio connectivity range?
	be used in this field.			- How does the open
				environment affect the
				received signal?
				- What problems can appear
				in the case of low power
				WSN?
				- Why is the connectivity
				between each animals' collar
				often sporadic?
				- What is the function of the
				Implicit Routing Protocol in
				respect to the cattle
				monitoring system?
				- What is the characteristic
				of the data configuration
				phase and the data
				forwarding phase?

46.	Applications of	This lesson allows the	- lecture	Upon completion of this	Successful	Formative, discussion
	Wireless Sensor	students to understand	- case study	unit, the student will be	supply chain	questions:
	Networks in the	the importance of the	- brainstorming	able to:	logistics calls for	- How can WSN-based
	Food Industry (A	application of WSNs in	, and the second	- define WSN -based	an automated	systems for monitoring the
	General Overview)	the Food Industry and to		system for monitoring;	and efficient	productive cycle of wine in
	– Part I	gain better knowledge on		-explain the applications	monitoring and	wineries be implemented
		all factors that could		of Wireless Sensor	control of all	and used successfully?
		potentially have a		Networks in the Food	operations. The	- Why is temperature the
		significant impact on the		Industry;	monitoring	most important factor in
		supply chain. The lesson		- explain the information	should allow	prolonging the practical shelf
		consists of lecture		gathered by the WSN;	establishing a	life of perishable food
		"Applications of Wireless		- define Cold Chain	better	products?
		Sensor Networks in Food		Monitoring and	knowledge,	- What sort of sensors can
		Industry".		Traceability	detecting	refrigerated vehicles host?
		The instructor and			weaknesses, and	- Are the sensors, controlling
		students will discuss the			optimizing the	the cooling used for other
		perishable food products			whole process,	purposes as well?
		supply chain			all things that	- Around what is the
		management with a			potentially could	application for monitoring
		special focus on the use			have a significant	the fresh fish logistic chain
		of wireless sensors in			impact on the	built?
		refrigerated vehicles,			supply chain.	- Why is sensor fusion
		containers, storage				proposed for the
		places, wineries, etc.				development of smart
						containers?
						- What are the positive
						features of the systems for
						intelligent containers,
						combining wireless sensor
						networks and RFID?

47.	Wireless Sensor	This lesson allows the	- lecture	Upon completion of this	Environmental	Formative, discussion
47.	Networks and the	students to understand		unit, the students will be	monitoring in	questions:
		that Environmental	- case study	able to:	<u> </u>	·
	Food Industry (in a		- brainstorming		Food Production;	- Why is environmental
	food factory,	monitoring is a key		- explain the importance	WSN setup -	monitoring , such as water
	Environmental	aspect in food		of WSNs' application in	parameters and	and air quality monitoring,
	monitoring,	production. In this		environmental	sensors,	essential in food production
	Sustainable food	respect, WSNs are a		monitoring in the food	hardware-	processes?
	production) – Part II	convenient solution for		factories;	software design	- Compared to the wired
		the food industry, where		- define measurable	and deployment	systems, what more
		production processes		parameters, important	in food factory.	functions can WSNs offer?
		cannot be interfered for		for the food production		- What are WSNs
		health reasons.		industry;		limitations?
		The lesson consists of a		- describe sensors that		- What parameters can be
		lecture: "Wireless Sensor		measure those		measured in the meat
		Network Solution for		parameters		production factory?
		Sustainable Food		- describe the WSN		- How can controlling the pH
		Production".		platform from both		level help to avoid toxic
		The instructor and		hardware and software		effects? Provide examples.
		students will interact to		points of view;		- Which sensors are used to
		answer questions about		- explain tests,		measure the relative
		WSN practical application		conducted in meat		humidity and air
		in a food factory, discuss		factory facilities		temperature?
		various parameters and		- analyse diagrams and		- Which are the four
		sensors of WSNs in		flow charts about the		capabilities required by WSN
		relation to the food		WSNs in the Food		nodes?
		industry. They will also		Industry.		
		discuss the challenges,				
		related to the sensors				
		selection and their				
		integration with the WSN				
		platform.				

48.	Wireless Sensor	This lesson allows the	- lecture	Upon completion of this	Various	Formative, discussion
	Networks and the	students to explore the	- case study	unit, the student will be	Applications of	questions:
	Food Industry	various applications of	- brainstorming	able to:	Wireless Sensor	- What parameters can be
	(Food Processing	Wireless Sensor		- understand the reasons	Networks in	measured with the help of
	Companies, the	Networks in the Food		for WSNs usage in	Food Industry to	WSNs in the wine industry?
	Chill Chain and the	Industry. The lesson		specific areas of the Food	prevent	- In which other segments of
	Wine Industry) –	consists of a lecture		Industry;	perishable types	the Food Industry could
	Part III	"Wireless Sensor		- explain the mechanism	of food from	WSNs be used aside from
		Networks and the Food		of WSNs functioning;	spoiling and to	the wine industry?
		Industry". The instructor		- define the stages of	enhance food	- How are sensors used with
		and students will interact		Chill Chain;	security	the fermentation process of
		to answer questions		- explain some issues		wine?
		about the specific		connected with the		- What is the function of the
		applications of WSNs,		application of WSNs in		WSNs in the process of wine
		their characteristics and		the Food Industry;		storage?
		requirements they have		- analyse diagrams and		- What are the main steps in
		to meet.		flow charts about the		the Chill Chain?
				WSNs in the Food		- Define 'primary chilling'
				Industry.		and 'secondary chilling'.
						- How are WSNs used in the
						stages of the Chill Chain?
						- Whose responsibility is the
						primary and secondary
						chilling?
						- Why is the role of WSNs so
						crucial during the
						transportation of food
						goods?
						- What issues could
						sometimes preclude the
						implementation of WSNs in
						the food industry?