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Erasmus+ Project

New curricula in Precision Agriculture using GIS technologies and sensing data

- CUPAGIS -

COURSES/PROGRAMME DESCRIPTION

Name of the program:

Bachelor Training on "Precision Agriculture"

University:

University Oran1 Ahmed Ben Bella

Contents

1 Year 1

1.1 Semester 1

1.1.1 Introduction to Plant Biology

Program title:	Introduction to Plant Biology	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 1, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	11	**Teaching language:**	French
Contact (email):	**Coordinating:** Pr CHAFI Mohammed El Habib **Others:** Dr ACHOUR Asma < achourasma@yahoo.fr> Dr BENLALDJ Amel Dr BIDAI Yasmina		

Program Description:

This subject will deal with fundamental aspects of the major physiological functions of plants. It will be structured in two parts: growth and development, on the one hand, and mineral and carbon nutrition, on the other. In addition, the student will benefit from the theoretical and practical bases necessary to understand the biological processes of species over time in order to acquire an analysis of natural ecosystems and their relationships with cultivated ecosystems. It also involves evolving towards the application of the concepts of conservation biology to the management of species and natural spaces. On the other hand, this teaching will allow the student to benefit from a conceptual and experimental mastery of the mechanisms conditioning the origin, the establishment, the maintenance, the regulation and the evolution of biological diversity within populations and communities.

It will also provide the student with environmental and ecological education for students to learn to master the fundamental aspects of plant ecology and understand how the distribution and abundance of plants are influenced by abiotic factors and biotic. He will also have the opportunity to discover the importance of plant ecology as a science connecting several scientific disciplines and related fields of application, notably agriculture, conservation biology, forestry, vegetation management. , the restoration of plant habitats, phytotechnology and mastery of the foundations of natural balance for sustainable development and the use of resources.

Objectives:

- Control of the different stages of the plant's life.
- Familiarize yourself with the different technical stages of seed germination.
- Understand the mechanisms of photosynthesis and the factors involved
- Analyze gas exchanges during photorespiration..
- Reason the relationships between water, mineral and carbon nutrition.

• Identify species, classify them, collect them, develop a herbarium • Contribute to the preservation of spontaneous species. • Use methods of conservation of plant material (seed bank, conservation "in situ" and "ex situ". • Become familiar with spontaneous and cultivated species responding to precision farming. • Characterize an ecosystem, describe it and analyze it to provide solutions to the identified environmental constraints.
Prerequisites:

1.1.2 Technological tools for Precision Agriculture

Program title:	Technological tools for Precision Agriculture	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 1, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	4	**Teaching language:**	English and French
Contact (email):	**Coordinating:** Pr Lebbah Yahia <ylebbah@gmail.com> **Others:** Pr Belkhodja Moulay Pr. Benaissa Noureddine		
Program Description: First, we introduce various concepts of precision agriculture and develop with students their own understanding of precision agriculture are introduced. The course details the importance of maps for decision making in agriculture. The instructor and students will interact to answer questions about precision agriculture and its uses. Students are also introduced to the science of computing, which is essential in precision agriculture technologies.			
Objectives: – define the state of PA; – explain the usefulness of maps in PA; – define GPS; – define GIS; – define in-situ and remote sensing, – define principles of geolocation for PA; – make the connexions between GPS and GIS; – use satellite imagery for PA; aware of technological tools (i.e., computer, electronics, ...) for PA;			
Prerequisites:			

1.1.3 Introduction to Computer Science

Program title:	Introduction to Computer Science	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 1, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	4	**Teaching language:**	French
Contact (email):	Dr. DAHANE Miloud < dahane.miloud@gmail.com >		

Program Description:
This course aims to introduce the fundamental concepts computer science. The overall objective is to present computer science as a standalone scientific discipline, with its own questions, its own problems, which are tackled by building specific methods and tools. During this course, we will review the main theoretical fundamentals and some practical realizations, but we will emphasis central concepts rather than techniques.

Objectives:
- Introduction and definitions of computer science and information technology;
- Discrete data and coding;
- Computers architectures;
- Software and advanced languages;
- Computer networks and the Internet;
- Initiation to algorithms;

Prerequisites:

1.2 Semester 2

1.2.1 Physiology and Nutrition

Program title:	Plant Physiology and Nutrition	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 1, Semester 2
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	9	**Teaching language:**	French

Contact (email):	**Coordinating:** Pr LAMARA Sid Ahmed Chawki < sclamara@gmail.com > **Others:** Pr IGHIL HARIZ Zohra Dr BIDAI Yasmina
Program Description: This teaching is the continuation and the deepening of the knowledge acquired in Semester 1. It must result in highlighting the importance of the phenomenon of the biological fixation of nitrogen, its ecological and economic interests and the various useful microorganisms involved in the nitrogen cycle. On the other hand, the student will have to take cognizance of the concepts of plant nutrition and the mechanisms involved in water transfers, absorption and migration of mineral elements from the soil. He will have to know the carbonaceous nutrition through the photosynthetic function according to the metabolic models, C3, C4 and CAM. It will also learn about the mechanisms of water transfer from the soil to the plant and in the plant at the cellular level. Then, it will have the opportunity to know the factors involved in plant transpiration in relation to stomatal regulation and the ability to establish a water balance at the plant level and to make a diagnosis on the symptoms of plant wilting resulting from a water deficit or the action of water stress.	
Objectives: •Understand the mechanisms of water and mineral transfer and exchanges between the plant and the soil solution. • Reasoning a water supply to the plant through irrigation • To establish a schedule of inputs to the plant. •The student must be able to establish a diagnosis related to a lack of water to establish a water balance at ground level and plant and reason a schedule of water supply to the plant.	
Prerequisites: Plant Physiology	

1.2.2 Statistics

Program title:	Statistics	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 1, Semester 2
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	3	**Teaching language:**	English and French
Contact (email):	Pr. Yahia Lebbah <ylebbah@gmail.com>		
Program Description: This course aims to prepare the student to probability theory and statistical reasoning. The course begins by introducing the basics of data preparation and statistical tables with their properties,			

thus allowing the student to better perceive probabilities theory. Subsequently, the course will address inferential statistics, including estimation and hypothesis testing. Finally, the course ends by introducing predictive models via regression. The course will focus particularly on practical work allowing students to grasp all the concepts of probabilities and statistics through case studies under R software.
Objectives: – master statistical computation programs in R; – understand and establish statistical tables and describe them; – exploit probability laws to characterize data and estimate its parameters; – exploit hypothesis test methods to validate experimental studies, particularly in the agricultural field; – predict future values of an indicator using a regression;
Prerequisites: Basic computer programming

1.2.3 Programming and Algorithms

Program title:	Programming and Algorithms	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 1, Semester 2
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	3	**Teaching language:**	French
Contact (email):	ASS. Said Fourour < saidfour@yahoo.fr >		

Program Description:
This course is an introduction to basic programming with the Python language, while emphasizing Algorithms.

Objectives:

- Extract information from remotely sensed data using a variety of manual and automated techniques.
- Perform image correction and enhancement on remotely sensed imagery.
- Apply acquired knowledge and critical thinking skills to solve a real-world problem with appropriate remote sensing data and processing methods.
- Process remotely sensed data to make it useful in geographic information systems.
- Develop multi-step remote sensing workflows to solve problems in a variety of application areas, especially for the precision agriculture area.

Prerequisites:
Introduction to Computers

1.2.4 Information systems and web/mobile programming

Program title:	Information systems, web and mobile development	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 1, Semester 2
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	3	**Teaching language:**	English and French
Contact (email):	Aribi Noureddine < aribi.noureddine@gmail.com > Lebbah Yahia		

Program Description:

This course covers two parts, namely information systems and web/mobile development. The objective of the first part is to provide students with the opportunity to acquire the basic knowledge and skills to specify and develop computer systems designed to process and store information. The course will examine in detail the development life cycle of a information system, showing some techniques, methods and methodologies used in the analysis, design and development of an organizational information system. This course also includes an introduction to database design to learn key concepts of data independence, database architecture, and the role of the database management system. The second part aims to train the student in web and mobile programming for the development of data management applications, particularly for agriculture. Finally, the student is introduced to the use of these computer technologies in a GIS environment.

Objectives:

- Demonstrate an understanding of the concept of information systems.
- Analyze existing information systems at the informational, organizational and technical levels.
- Use the Development Life Cycle for real-world cases.
- Use Data Dictionary and other analysis and design tools.
- Design and implement proper information systems.
- Construct a conceptual database model given a specific application case study.
- Build a physical relational model of the database from the conceptual model.
- Write database queries to answer user questions.
- Effectively utilize database management systems to organize, store and retrieve data.
- Install and use client-side and server-side web applications.
- Develop web and mobile applications.

Prerequisites:
Basic programming skills

2 Year 2

2.1 Semester 3

2.1.1 Agricultural Ecosystems

Program title:	Agricultural ecosystems	**University:**	Oran1 Ahmed Ben Bella

Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 2, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	11	**Teaching language:**	French
Contact (email):	**Coordinating:** Pr BENAISSA Noureddine < n_benaissa@yahoo.fr > **Others** Pr LAMARA Sid Ahmed Chawki Pr BELKHODJA Moulay		
Program Description: It aims to strengthen students' knowledge of the soil as a biological support and its role in the balance and survival of organisms, taking into account the specificity of soils and ecosystems. The student must know the essential notions relating to the soil, its constituents and its organization. and understand the biological functions of soils in order to integrate them into sustainable plant production activities. Then, he must acquire a practice of analyzing the microbiological functioning of a soil and discern the conditions of the environment as well as favorable or unfavorable practices. The acquired data will highlight the soil-water-plant-microorganism interactions.			
Objectives: • Identify the texture of a soil and its structure • Analyze the physical and chemical characteristics • Distinguish variations in plant responses under abiotic and biotic stress • Determine the period, the irrigation water requirements and the irrigation technique according to the type of crop.			
Prerequisites:			

2.1.2 Data analytics

Program title:	Data analytics	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 2, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		

Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	4	**Teaching language:**	English and French
Contact (email):	Pr. LOUKIL Lakhdar < loukil_lakhdar@yahoo.fr >		

Program Description:
This module is a first course on exploration, cleaning, preparation, processing and visualization of a dataset. It starts with a review of linear algebra and probability theory, allowing the student to have a good intuition on the necessary conditions to use data analytics tools. Classical methods of data analytics are first discussed. The course also introduces the different types of ML and the different algorithms for classification, prediction, clustering and dimensionality reduction problems. The course will focus particularly on practical works allowing students to grasp data analysis techniques via case studies with the Python language.

Objectives:

- Explore, clean, wrangle a dataset.
- Preprocess and transform data into an appropriate form for the data analysis algorithm.
- Use traditional analytic methods including PCA (principal component analysis), CA (correspondence analysis) and their variants.
- Apply basic machine learning methods on a dataset.
- Develop in Python a full stack data analysis process from raw data acquisition to data visualization and interpretation through data preparation and data analysis.

Prerequisites: Basic programming skills in Python

2.1.3 Bioinformatics

Program title:	Bioinformatics	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 2, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	2	**Teaching language:**	French
Contact (email):	Dr. Amouri Adel Amar < amouriaa@yahoo.fr >		

Program Description:
The objective of this course is to provide students with basic training in the field of biological sequence analysis (nucleic or protein). The module will examine in detail the main bioinformatics methods of pattern search and word statistics, sequence alignment, molecular evolution models and phylogenetic

tree building. This module will also allow students to better understand the field of genomic bioinformatics.
Objectives: – use basics of biostatistics;
Prerequisites: Statistics, basic computer programming

2.1.4 Image Processing and Computer Vision

Program title:	Image Processing and Computer Vision	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 2, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	4	**Teaching language:**	English and French
Contact (email):	**Coordinating:** Dr. Noureddine Aribi < aribi.noureddine@gmail.com > **Others:** Pr. Yahia Lebbah Dr. Mohammed Sayah		
Program Description: The module will also tackle image processing and computer vision, which are important and fast evolving areas of computer science, and have been applied in many disciplines. This course introduces students to the fundamental concepts and techniques for image processing and computer vision. Topics to be covered include image formation, image enhancement, edge detection and segmentation, morphological processing, object recognition, object detection and tracking, machine-learning techniques for image processing and vision. This course will particularly exploit multispectral images for agricultural purposes.			
Objectives: – Perform low-level image processing for analysis of image properties; – Apply computer vision algorithms for scene/object understanding and interpret the results; – Assess and apply different computer vision and image processing approaches for real-world problems;			
Prerequisites: Statistics, basic computer programming			

2.2 Semester 4

2.2.1 Production and agricultural health

Program title:	Agricultural Production and Health	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 2, Semester 2
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	6	**Teaching language:**	French
Contact (email):	**Coordinating:** Pr HADDAD Fatima Zohra < zohra13@yahoo.com > **Others:** Pr BELKHODJA Moulay Dr Achour		

Program Description:

The objective of this unit is to provide the student with an education allowing him/her to understand the agro-ecophysiological functioning, analysis and methods of diagnosis and design of cropping systems, in the field of plant production in relation to concepts and agrarian practices. It will then be necessary to carry out observations on the diversity of microorganisms in the field of phytopathology, parasitology, nematology and bacteriology in order to carry out identifications, establish a diagnosis of diseases and propose appropriate means of protection, safeguarding and Control.

Objectives:

To propose a technical itinerary for the establishment of a culture.
• Make observations during the vegetative and reproductive stages of plants to establish a diagnosis on the growth, the development of the plant, the flowering phase.
• Analyze the production during the maturation phase of the plant
• To evaluate the yield.
• Control of the different stages of the plant's life.
• Analyze a diagnosis following a diversity of observations then to propose a means of control appropriate to the disease having various origins.
• Distinguish the different classes of phytosanitary products, their use, their instructions for use, and the treatment period

Prerequisites:

- Mastery of water transfer mechanisms from soil to plant
- Approach to reason a program of irrigation
- Choice and calculation of fertilizer Doses

2.2.2 GIS for Precision Agriculture

Program title:	GIS for Precision Agriculture	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 2, Semester 2
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	3	**Teaching language:**	French
Contact (email):	Pr. Noureddine Benaissa < n_benaissa@yahoo.fr > **Others:** Mrs. Houria Khelfaoui		
Program Description: A GIS (Geographic Information System) is a computer system allowing, from various sources, to collect and organize, manage, analyze and combine, develop and present information located geographically, contributing in particular space management. The objective of the course is to introduce students to GIS for the needs of agriculture, conceptually and practically via practicals in a GIS environment (e.g., QGIS).			
Objectives: – GIS System Functionalities – Geographic Database – Interpretation of satellite and aerial photography – Detection of agriculture crops – Reading and Interpretation of maps – Visualization and illustration of data on GIS system			
Prerequisites: Statistics, computer programming, basic of image processing			

2.2.3 Sensor Systems for Precision Agriculture

Program title:	Sensor Systems for Precision Agriculture	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 2, Semester 2
Web link of the university:	*https://vrre.univ-oran1.dz/*		

Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):		**Teaching language:**	English and French
Contact (email):	Dr. Amine Dahane < amineusto.laresi@gmail.com >		

Program Description:

Nowadays wireless sensor networks (WSN) are used to solve different real-time problems in different areas like agriculture. They are used for monitoring, measuring temperature, humidity, measuring water supply, and so on. they help the farmer produce the crop in large quantities and reduce the cost of the yield.

This course introduces the common principles and the technical requirements for wireless sensor networks (WSN), and describes their role in precision agriculture (PA) as application. The course also aims to deliver knowledge about different aspects of sensors, how to use them and how to integrate their data into the decision-making process. Various technical foundations of the sensor systems will be detailed such as, basics of metrology (accuracy, precision, resolution, error, etc.), type of signal, data acquisition and communication.

Objectives:

- A vision of the role played by environmental sensors in precision agriculture
- Knowledge of the different sensors (in-situ, yield, etc.) and their possibilities and limitations
- An understanding of the principles common to sensors and the technical requirements for their implementation
- data acquisition, prediction, and visualization.
- Practical experience with current technology of successful sensor systems improving the existing agricultural plot
- A working knowledge of the operation of sensors and data acquisition in the field
- A motivation to process sensor data and integrate the derived information into the information system for the management of operations
- An overview of emerging sensor-related technologies and future developments

Prerequisites: Sensing, data storage, Algorithmic.

2.2.4 Remote sensing

Program title:	Remote sensing	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 2, Semester 2
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		

Credit points (ECTS):	3	**Teaching language:**	English and French
Contact (email):	Dr. Noureddine Aribi < aribi.noureddine@gmail.com >		
Program Description: This course introduces students to the basic knowledge of remote sensing, characteristics of remote sensors, and remote sensing applications in academic disciplines and professional industries. We will focus on image acquisition and data collection techniques in the electromagnetic spectrum and dataset manipulations.			
Objectives: • Extract information from remotely sensed data using a variety of manual and automated techniques. • Perform image correction and enhancement on remotely sensed imagery. • Apply acquired knowledge and critical thinking skills to solve a real-world problem with appropriate remote sensing data and processing methods. • Process remotely sensed data to make it useful in geographic information systems. • Develop multi-step remote sensing workflows to solve problems in a variety of application areas, especially for the precision agriculture area.			
Prerequisites: Mathematics and applied physics, basic programming skills.			

3 Year 3

3.1 Semester 5

3.1.1 Agricultural Technologies

Program title:	Agricultural technology	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 3, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	10	**Teaching language:**	French
Contact (email):	**Coordinating:** Pr IGHIL HARIZ Zohra < zoraighil@yahoo.fr > **Others:** Pr Chafi Mohammed El Habib Dr BIDAI Yasmina		
Program Description: The student will have to become familiar with the different inputs and their use. He will also have to reason with an appropriate fertilization taking into account the soil conditions, the plant species and the vegetative stage of the plant. The aim is to analyse the causes and consequences of the salinization			

process by relying on the factors responsible for the degradation of salty soils. The characterization of salty soils will make it possible to foresee the most appropriate solutions to implement strategies for the control of salinity and rehabilitation, in particular agricultural soils. On the other hand, it will be a question of familiarizing the student with the potential material integrated in the technical route of the agricultural works. The student will have to know the operating principles of each machine and its use according to the conditions of the environment and the cycle of the plant; he will benefit from an approach on modern tools such as sensors, drones for precision farming.
Objectives: To propose a technical itinerary for the establishment of a culture with account to the fertilizer needs . • Make observations during the vegetative and reproductive stages of plants to establish a diagnosis on the growth, the development of the plant, the flowering phase. • To evaluate the yield. • Control of the different stages of the plant's life. • Analyze a diagnosis following a diversity of observations then to propose a means of control appropriate to the physiological diseases having various origins. • Distinguish the different classes of inputs fertilizer, their use, their instructions for use, and the intake period
Prerequisites: - Control of the physical, chemical and biological parameters of the soil - Approach to reason a program of agricultural inputs - Choice and calculation of fertilizer Doses

3.1.2 Advanced GIS Techniques for Precision Agriculture

Program title:	Advanced GIS Techniques for Precision Agriculture	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 3, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	4	**Teaching language:**	French
Contact (email):	**Coordinating:** Pr. Noureddine Benaissa < n_benaissa@yahoo.fr > **Others:** Mrs. Houria Khalfaoui		
Program Description: The aim of this advanced course is to train the student to the skills of a GIS analyst for precision agriculture, manager GIS for precision agriculture, administrator GIS for precision agriculture, developer GIS for precision agriculture, and coordinator GIS for precision agriculture.			
Objectives: – Manage Agricultural database			

– Tracking and Monitoring of agriculture crops – Display data and regions in agricultural maps – Coordinate of GIS projects – Manage a specific area of agricultural interest – Integration of Drones data – Integration of Remote Sensing – Manage Big data collected for agriculture – Make available to the farmers the agricultural information – Create data interpolation maps for precision agriculture
Prerequisites: computer programming, basic of image processing

3.1.3 Global Navigation Satellite Systems

Program title:	Global Navigation Satellite Systems	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 3, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	4	**Teaching language:**	English and French
Contact (email):	Pr. KADDOUR Mejdi < mejdi.kaddour@gmail.com >		

Program Description:
The use of Global Navigation Satellite Systems (GNSS) such as the Global Positioning System (GPS), for accurately determining positions on earth, has grown exponentially since the late 1980s and early 1990s. This course presents fundamental information on structure, characteristics and use of GPS and other Global Navigation Satellite Systems. Background information is provided and the basic principles of using the GNSS systems are introduced. The course emphasizes benefits of GNSS in precision farming with an extensive discussion on the main usage scenarios and derived products.

Objectives:
- Implement basic algorithms for estimation of GNSS based positions
- Demonstrate how to maintain, calibrate, and care for GPS equipment
- Apply professional methodologies for GNSS data collection and processing
- Plan, perform and process precise GNSS measurements
- Prepare data to be shared and integrated with GIS

Prerequisites:
Mathematics, Basic programming skills.

3.1.4 Artificial intelligence, machine learning and big-data

Program title:	Artificial intelligence, machine learning and big-data	**University:**	Oran1 Ahmed Ben Bella
Degree:	Bachelor's degree in Precision Agriculture	**Standard period of study:**	Year 3, Semester 1
Web link of the university:	*https://vrre.univ-oran1.dz/*		
Web link of the program:	*https://vrre.univ-oran1.dz/Cupagis/*		
Credit points (ECTS):	3	**Teaching language:**	English and French
Contact (email):	Pr. Lakhdar Loukil < loukil_lakhdar@yahoo.fr > Pr. Yahia Lebbah Dr. Aribi Noureddine		

Program Description:

Teach the basics of artificial intelligence and machine learning useful in the decision-making process for precision farming. The course ends with an introduction to Big Data tools which allow the processing of large agricultural data sets.

Objectives:

– mastering of current python learning environments (e.g., scikit-learn, etc.) in order to solve the problems of data analysis in agriculture
– Use of supervised and unsupervised learning (clustering) in agriculture
– Use of pattern-oriented search
– Use of reinforcement learning
– Use big-data environments

Prerequisites:

Statistics, computer programming, basic of image processing.