SHORT TEACHING GUIDES FOR SUBJECTS OF GIASB Bachelor Degree

518101006 Geology, Soil Science and Climatology

UNIT 1.- SOIL SCIENCE

Lesson 1 (L1): Soil Science: concepts and uses. Soil formation. Forming factors and processes. The soil profile.

Lesson 2 (L2): Soil constituents. Solid phase.

Lesson 3 (L3): Soil constituents. Liquid and gas phases.

Lesson 4 (L4): Physical Properties

Lesson 5 (L5). Physicochemical properties.

Lesson 6 (L6). Soil classification

Lesson 7 (L7). FAO soil classification.

Lesson 8 (L8). Soil cartography.

UNIT 2.- CLIMATOLOGY

Lesson 1 (L9). Weather and Climate.

Lesson 2 (L10). The solar radiation, the temperature and the atmospheric pressure.

Lesson 3 (L11). Wind, humidity, cloudiness, and precipitation and air masses and fronts.

Lesson 4 (L12). Agricultural Climatology: Climatic zonation and climate indices. Climate of Spain.

UNIT 3.- GEOLOGY

Lesson 1 (L13). Study methods and basic principles of geology: interest and applications. Soil Science. Evolution of the Science and the concept of the object of study. Relationship of Soil Science with other sciences. Climatology and its relationship with the agronomy.

Lesson 2 (L14). Classification of Petrogenetic minerals. General characteristics of the main silicate minerals. Silicates: general characteristics and structural classification.

Lesson 3 (L15). Concept and genetic classification of rocks. Magmatic processes. Chemical and mineralogical composition of igneous rocks. Main families of igneous rocks.

Lesson 4 (L16). Sedimentary rocks: origin and sedimentary environments. Diagenesis. Classification of sedimentary rocks. Major sedimentary rocks.

Lesson 5 (L17). Metamorphic processes. Types of metamorphism. Metamorphic facies. Top metamorphic rocks.

Lesson 6 (L18). Geodynamics. Hydrosphere. The hydrological cycle. Groundwater. Geological action of rivers. Fluvial cycle.

Lesson 7 (L19). Modeling of the relief. Influence of lithology on modeling the relief. Influence of tectonics.

Lesson 8 (L20). Influence of climate modeling in relief. Climatic zonation. Morphoclimatic major systems.

518101008 Plant Physiology:

Unit 1: Water balance and translocation pathways

Chapter 1. Introduction to Plant Physiology
Chapter 2. Water in plant cell.
Chapter 3. Water balance.
Chapter 4. Translocation in the phloem.

Unit 2: Nutrition and metabolism

Chapter 5. Mineral nutrition.
Chapter 6. Photosynthesis and productivity.
Chapter 7. Introduction to plant metabolism. Secondary metabolism.

Unit 3: Growth and development

Chapter 8. Growth, development and differentiation.
Chapter 9. Hormones: Auxins, Cytokinins, Gibberellins, Brassinosteroids, Ethylene, Abscisic acid.
Chapter 10. Other hormones and plant growth regulators.
Chapter 11. Light and temperature.

Unit 4: Stress Physiology

Chapter 12. Biotic stress.
Chapter 13. Abiotic stress.

518102005 Animal Production:

Block I.- Animal Physiology

1.1. Reproduction: anatomy of the reproductive apparatus of the female. Exocrine and endocrine function of the ovary. Oestrus cycle
1.2. Reproductive efficiency: Technical indicators. Female Classification according her cycle. Synchronization of the cycle. Artificial Insemination. Embryo Transfer. Diagnosis of pregnancy
1.3. Lactation and milking machine: lactation physiology, lactation curve. Milk composition for the main specie. Milking machine. Milking Techniques. Milking Room
1.4. Growth and Meat Production: Growth curves. Technical Indicators. Carcass quality. Parts of the carcass. Meat quality: PSE and DFD meat. Meat composition
1.5. Eggs Production: Anatomy of the hen. Physiology of egg production. Laying curve.

Block II. Animal Nutrition

2.1. Definition. Nutritive value of the food. Nutritive Needs of the animals
2.2. Foods for animals. Classification. Energy food. Protein Food. Grass and Forage. Persevered Forage. Additives.
2.3. Digestive Process for monogastric and for ruminants. Digestibility.
2.4. Energy Value of the food. Methods to value food. INRA Method
2.5. .Protein Value of the food. Methods to value food. INRA Method
2.6. Capacity to ingest food.

Block III.- Ruminants

3.1. Dairy cows. Milk productions. Dairy practices. Breeds.
3.2. Beef production. Calves productions. Breeds.
3.3. Sheep and goats productions. Breeds.
3.4 Stables.
3.5. Agriculture Common Policy

Block IV. Monogastrics.

4.1.Pigs Productions. Systems. Breed. Good practices.
4.2. Rearing and finished pigs. Productions systems
4.3. Welfare and stables.
4.4. Laying Hens. Productions systems.
4.5. Broilers. Production systems. Stables.
4.6. Technical Management in animal production.

518102009 Environmental Physics:

Unit I. The bases of climate formation

Lesson 1. Atmosphere: composition and structure
Lesson 2. The state variables of moist air
Lesson 3. Calculation of the state variables of moist air
Lesson 4. Radiation. Laws and basic concepts (I)
Lesson 5. Radiation. Laws and basic concepts (II)
Lesson 6. The solar radiation
Lesson 7. Longwave radiation
Lesson 8. Net radiation

Unit II. Measurements of the climate variables

Lesson 9. Measurement of temperature and humidity
Lesson 10. Measurement of CO_2 concentration and wind
Lesson 11. Measurement of radiation using thermal and quantum sensors

Unit III. Energy and mass transfer processes and environmental applications

Lesson 12. Energy transfer processes and environmental applications
Lesson 13. Mass transfer processes and environmental applications

Unit IV. Vegetation monitoring and remote sensing

Lesson 14. Remote sensing: processes
Lesson 15. Remote sensing: components
Lesson 16. Remote sensing: applications

518103005 Irrigation and drainage:

DIDACTIC UNIT I. REVISION OF CONCEPTS

UNIT 1. Water cycle. History.
UNIT 2. The soil-plant-atmosphere (SPA) system.
UNIT 3. The water in the SPA system.
UNIT 4. Water demand of crops and water use efficiency.

DIDACTIC UNIT II. METHODS AND SYSTEMS OF IRRIGATION

UNIT 5. Introduction to methods of irrigation.
UNIT 6. Efficiencies of irrigation systems.
UNIT 7. The design of irrigation systems.
UNIT 8. Choice and development of irrigation system.

DIDACTIC UNIT III. OVERHEAD IRRIGATION

UNIT 9. Characteristics and components.
UNIT 10. Uniformity in sprinkler irrigation.
UNIT 11. Stationary irrigation.
UNIT 12.- Mechanized systems to displacement.
UNIT 13.- Hydraulic design of stationary systems.

DIDACTIC UNIT IV. LOCALIZED IRRIGATION

UNIT 14. Charactersitics and components.
UNIT 15. Emitters of thrickle irrigation.
UNIT 16. The wet bulb.
UNIT 17. The head drip irrigation system.
UNIT 18. Control and automation.
UNIT 19. Agronomic localized irrigation design.
UNIT 20. Hydraulic design of a subunit.

DIDACTIC UNIT V. SURFACE IRRIGATION

UNIT 21. Characteristics and components.
UNIT 22 Theoretical basis of surface irrigation.
UNIT 23. Flood irrigation.
UNIT 24. Runoff irrigation.

DIDACTIC UNIT VI. DRAINAGE SYSTEMS

UNIT 25. Introduction to drainage methods.

518103006 Genetics:

Teaching Unit 1.

INTRODUCTION
Genetics a Basic and applied science; history of Genetics; the importante of Genetics in agrobiological sciences

TRANSMISSION OF THE HEREDITARY MATERIAL
Topic 1. Mendelian principles of inheritance.
Topic 2. Extensions of mendelian analysis.
Topic 3. Chromosome theory of inheritance and variations.¿
Topic 4. Ligation and recombination in eukaryotes.

Teaching Unit 2.

NATURE AND PROPERTIES OF THE HEREDITARY MATERIAL

Topic 5. Nature, composition and structure of the hereditary material.
Topic 6. Organization of the hereditary material.
Topic 7. Replication and reparation of DNA.

Teaching Unit 3.

EXPRESSION OF THE GENETIC INFORMATION¿
Topic 8. Primary activity of the genes and DNA transcription.
Topic 9. Genetic code and synthesis of proteins.
Topic 10. Gen mutations and transposable elements.
Topic 11. Developmental genetics.
Topic 12. Molecular analysis and technology of recombinant DNA and biotechnological appalications

Teaching Unit 4.QUANTITATIVE AND POPULATION GENETICS

Topic 13. Population genetics and evolution.¿
Topic 14. Inheritance of quantitative characters.

518103011 Environmental management and policy:

UNIT 1 -. Basics
1. Introduction
2. Environmental economy and sustainable development
UNIT. 2 - Natural Resources and Policies
3. Environnemental resources allocations
4. Environmental policy. Alternatives and tools.
UNIT. 3 - Environmental Assessment and Value
5. Environmental valuation
6. Environmental policy assessment

518103026 Green Infrastructures:

UD1. Green Infrastructures

Item 1. Ecoplanning: Concept and history of Green Infrastructure.
Item 2. Composition of Green Infrastructure: Typologies and characteristics.
Item 3. Multifunctionality and benefits.
Item 4. Eco-indicators and green planning.

UD2. Green Infrastructures Project

Item 5. Concepts and bases of the Green Infrastructure project.
Item 6. The renaturalization of cities or Nature-Based Solutions (SBN).
Item 7. Urban Naturation: Green Roofs and Vertical Gardens
Item 8. Urban Agriculture

UD3. Urban Forests

Item 9. Overview of arboriculture. Ecosystem services.
Item 10. Environmental and ecological criteria in the selection of trees for urban environments.
Item 11. Implementation, management and conservation. The green services company.
Item 12. Valuation of trees and palm trees: Norma Granada 2020.

518103004 Diagnosis and Agricultural Chemistry:

I. Introduction to Agricultural Chemistry (Units 1-2)

1. Agricultural Chemistry: Concept, backgrounds and perspectives.
2. Edaphic properties and soil fertility.

II. Mineral Nutrients (Units 3-8)

3. Chemical elements and plant life.
4. Macroelements: Nitrogen.
5. Macroelements: Phosphorus.
6. Macroelements: Potassium.
7. Macroelements: Calcium, Magnesium and Sulphur.
8. Microelements.

III. Agrochemicals: Fertilizers and Pesticides (Units 9-11)

9. Fertilizers.
10. Pesticides. General concepts.
11. Environmental aspects of the employment of agrochemicals in agrosystems.

IV. Agricultural Diagnosis (Units 12-15)

12. Agricultural diagnosis.
13. Analysis and diagnosis of irrigation waters.
14. Analysis and diagnosis of agricultural soils.
15. Analysis and diagnosis of plant material.

518104002 Vegetable crops:

Unit 1.

Lesson 1. Introduction.

Unit 2.

Lesson 2. Onion
Lesson 3. Garlic and leek
Lesson 4. Carrot
Lesson 5. Potato

Unit 3.

Lesson 6. Asparagus

Unit 4.

Lesson 7. Cabbage
Lesson 8. Lettuce and endive
Lesson 9. Celery
Lesson 10. Baby leaf vegetables

Unit 5.

Lesson 11. Artichoke
Lesson 12. Cauliflower and broccoli

Unit 6.

Lesson 13. Tomato
Lesson 14. Pepper
Lesson 15. Eggplant
Lesson 16. Melon
Lesson 17. Cucumber
Lesson 18. Watermelon and zucchini
Lesson 19. Strawberry
Lesson 20. Legumes

518104001 Degradation of ecosystems and techniques of restauration:

Unit I. Introduction to ecosystem degradation

Lesson 1. Global view of environmental degradation.
Lesson 2- Basic concepts on soil degradation processes in ecosystems. The role of soil and vegetation cover.

Unit II. Edaphic aspects of degradation of ecosystems and their regeneration.

Lesson 3-Soil and ecosystem services. Soil quality indicators.
Lesson 4- Biological and physical soil degradation. Reclamation strategies.
Lesson 5- Hydric and aeolian erosion. Factors, forms and consequences of soil erosion. Prediction and evaluation of soil erosion. Techniques to prevent erosion
Lesson 6-Salinization and saline ecosystems.
Lesson 7- Soil Contamination. Strategies for soil management and remediation in semiarid polluted areas.

Unit III. Degradation and regeneration of soil plant cover

Lesson 8-Introduction to ecological restoration. Basic concepts.
Lesson 9-Loss of habitats and their fragmentation
Lesson 10-Revegetation techniques. Concepts and definitions.
Lesson 11- Planning of afforestation and plant species selection
Lesson 12- Previous works to afforestation and related machinery
Lesson 13- Sowing methods and planting in ecosystems reclamation
Lesson 14- Design and maintenance of revegetation projects.

Unit IV. Study cases

Lesson 15- Natural regeneration in post-fired landscapes.
Lesson 16- Environmental impacts and sustainable management in anthropogenic multi-impacted areas.

518109001 Plant Biotechnology:

Unit 1: Introduction to Plant Biotechnology Unit 2: In vitro culture of plant materials
Unit 3: Transgenic plants

Unit 1: Introduction to Plant Biotechnology
C1. Introduction to Plant Biotechnology. Definitions.
C2. Organization of a Plant Biotechnology laboratory. Equipment and supplies.

Unit 2: In vitro culture of plant materials
C3. Basic methodologies in plant tissue culture.
C4. Cell cultures. Plant regeneration.
C5. Meristem culture. Production of pathogen-free plants.
C6. Micro-propagation.
C7. Somatic embryogenesis. Production of synthetic seeds.
C8. Production of haploid plants.
C9. In vitro germplasm preservation.
C10. Production of secondary metabolites by plant cell, tissue, and organ cultures.

Unit 3: Transgenic plants
C11. Transgenic plants I: Plant genetic transformation methodologies.
C12. Transgenic plants II: Applications.
C13. Transgenic plants III: Legal and ethical considerations.

518109003 Genomics:

Genomes, proteomes and metabolomes

Techniques to study genomes

Genome function: transcription, translation and gene regulation

Genome replication and evolution

518103012 Food quality, safety and traceability:

Teaching unit 1. Food quality management: concepts and legislation.

1.1. Introduction. The concept of quality. Legislation.
1.2. Application of the total quality system in agrofood industry.
1.3. Norms ISO 9000. Application.
1.4. Other norms of use in agrofood industry. IFS. BRC.

Teaching unit 2. Quality control organization in the food industries.

2.1. Quality planning. Deployment of the quality function.
2.2. Development of new products. Benchmarking. AMFEC.
2.3. Research, Development and Innovation in the agrofood industry.

Teaching unit 3. Food safety: concepts and legislation.

3.1. Importance of foodborne transmissible diseases.
3.2. Previous requirements of hygiene and traceability.
3.3. Hazard Analysis and Critical Control Points systems (HACCP).
3.4. Norm ISO 22000: Food safety management system.

Teaching unit 4. Risk analysis. Application to food industries.

4.1. Elements of risk analysis.
4.2. Quantitative risk assessment and predictive microbiology.
4.3. Application of risk analysis to ensure food safety.

Teaching unit 5. Traceability in the food industry.

5.1. Introduction to traceability. Legislation.
5.2. Traceability management systems. Norm ISO 22005.
5.3. Control, verification and validation of the system.

Teaching unit 6. Food analysis: methodology, equipment and legislation.

6.1. Functional properties of foods.
6.2. Food analysis: analytical techniques and basic instrumentation. Current legislation.

518103017 Food Microbiology

Teaching Unit 1. Basis of microbiology.

1.1. Introduction.
1.2. Main characteristics of microorganisms.
1.3. Microbial nutrition and growth.
1.4. Microbiological analysis techniques.

Teaching Unit 2. Food microbiology.

2.1. Microbial ecology of foods.
2.2. Control of microorganisms by physical and chemical methods.
2.3. Food borne pathogen microorganisms.
2.4. Microbiology of food groups.

518103019 Equipment for the processing and packaging of foods

UNIT 1: EQUIPMENT PACKAGING

T1.1: Historical Background and general concepts.
T1.2: The package as a business strategy.
T1.3: Traditional, active and intelligent packaging.
T1.4: Aseptic packaging.
T1.5: Packaging Design, Materials and Equipment.

UNIT 2: EQUIPMENT FOR CONTINUOUS TRANSPORTATION OF SOLID

T2.1: Physical Characteristics of Solid
T2.2: Conveyors. Bucket Elevators. Chain conveyors. Screw conveyors. Vibrant Transport
T2.3: Pneumatic Conveyors.

UNIT 3: HEAT EXCHANGERS AND STEAM INSTALLATIONS

T3.1: Introduction to the steam plant. Heat exchangers.
T3.2: Steam. Boilers
T3.3: Design of steam Pipelines and condensate return. Pipe insulation.

UNIT 4: INDUSTRIAL INSTRUMENTATION

T4.1: General characteristics of industrial instrumentation
T4.2: Temperature Probes
T4.3: Probes pressure and force
T4.4: Probes of Position

UNIT 5: AUTOMATIC CONTROL EQUIPMENT

T5.1: Overview of automatic control.
T5.2: Major systems of control. PLC's
T5.3: PID. Different techniques of tuning.
T5.4: Programming PLC's.

UNIT 6: MATERIALS AND EQUIPMENT FOR THE TRANSPORT OF LIQUID MATERIALS

T6.1: Design criteria in liquid material transportation facilities.
T6.2: Main types and materials of pumps.
T6.3: Pipelines. Definitions, standards and materials.
T6.4: Types of valves.

518103016 Food engineering operations:

1. INTRODUCTION

Unit 1. Introduction to the bases of food preservation
Unit 2. Historical development. Industrial methods of food preservation and processing
Unit 3. Introduction to unit operations of the food industry
Unit 4. Unit operations of food engineering
Unit 5. Unit systems and dimensional analysis

2. MASS AND HEAT TRANSFER

Unit 6. Transport phenomena and mechanisms
Unit 7. Macroscopic material balances
Unit 8. Macroscopic energy balances

3. FLUIDS TRANSPORTATION

Unit 9. Rheology.
Unit 10. Fluids transportation through pipes

4.- HEAT TRANSFER

Unit 11. Fundamentals of heat transfer
Unit 12. Heat transfer by conduction
Unit 13. Heat transfer by convection
Unit 14. Heat transfer by radiation

5. OPERATION BASED ON HEAT TRANSFER

Unit 15. Heating/Cooling in heat exchangers.
Unit 16. Heating/Cooling in agitated tanks

518104011 Wine and fermented products technology:

TEACHING UNIT 1: INTRODUCTION.

T1. Introduction.
T2. Microorganisms in the fermentation.
T3. Effects of fermentations in fermented foods.

TEACHING UNIT 2: WINE TECHNOLOGY.

T4. Introduction
T5.Grape and must wine.
T6. Fermentations.
T7. Basic operations
T8. Shulphurose
T9.Yeasts
T10.White wine.
T11. Red wine.
T12. Special vinifications.
T13. Rose wine.
T14. Champagne.
T15. Special wines
T16. Ageing
T17. Clasification of wines
T18. Clarification of wines.
T19. Problems in wines.
T20. Tasting. Health and wine. Origin denominations.

TEACHING UNIT 3: OTHER ALCOHOLIC FERMENATTIONS

T.21. Beer
T.22. Bread
T.23. Cider and distilled

TEACHING UNIT 4: OTHER FERMENTATIONS

T.24. Pickles
T.25. Vinegar

518104009 Postharvest technology of fruits and vegetables:

1.- INTRODUCTION AND FUNDAMENTALS

1.- Introduction and fundamentals of postharvest technology.
2.- Main factors affecting postharvest quality and safety
3.- Structure and composition of fruit and vegetables

2.- HORTICULTURAL MATURATION AND QUALITY

4.- Maturation and ethylene.
5.- Quality of horticultural produce
6.- Cellular and metabolic effects of low temperature in horticultural produce
7.- Preharvest factors affecting postharvest shelf life
8.- Fungal, physiological and mechanical damages disorders

3.- COLD STORAGE ENGINERRING AND TECHNOLOGY. COADYUVANTS

9.- Pre-cooling techniques
10.- Controlled atmosphere storage techniques
11.- Modified atmosphere packaging techniques
12.- Postharvest ethylene application techniques
13.- Stretegies to control ethylene in postharvest
14.- Preconditioning techniques
15.- Refrigerated transport of perishable product

4.- FRUITS AND VEGETABLES HANDLING AND PROCESSING TECHNIQUES

16.- Postharvest handling systems of fruits I: citrus
17.- Postharvest handling systems of fruits II: table grapes, berries, pomegranates and others
18.- Postharvest handling systems of fruits III: stone and pome
19.- Postharvest handling systems of vegetables I: leafy, stem and inflorescences
20 Postharvest handling systems of vegetables II: fruit vegetables
21.- Postharvest handling systems of vegetables III: underground
22.- Postharvest handling systems of fresh-cut products I. Introduction and concepts
23.- Postharvest handling systems of fresh-cut products II. Unit Operations and equipments
24.- Postharvest and fresh-cut facilities design
25.- By-products revalorizations from the fruit and vegetables industry

PRACTICAL LESSONS:

1.- Postharvest information resources. Scientific databases
2.- Quality and maturity index determination
3.- Respiration and ethylene emission rates determination
4.- Fresh-cut produce preparation. Quality and shelf life determination
5- Nutritional quality analysis and determinations

518109016 Technology of meat and dairy products:

Teaching Unit 1. Technology of Meat Products.

1.1. Introduction.
1.2. Structure, physical, chemical and sensorial properties of meat.
1.3. Meat microbiology. Spongiform encephalopathies.
1.4. Technology and facilities for animal slaughtering.
1.5. Meat products. Classification and producing.
1.6. Exploitation of meat by-products.

Teaching Unit 2. Technology of Dairy Products.

2.1. Milk constituents.
2.2. Physical, chemical and sensorial properties of milk.
2.3. Milk microbiology.
2.4. Milk production and operations prior to its treatment.
2.5. Milk pasteurisation and sterilisation.
2.6. Dairy products.
2.7. EU regulation for meat and dairy products. Future prospects.

518109012 Aquaculture and derivatives industry:

Block 1.- Core Subjects (9 h)

Unit 1.- Basics Concepts. Aquaculture Sector: role in Spain, E.U and World. Macromagnitudes. (1h)
Unit 2.- Aquatic environmental and their characteristics. Main Production Systems. (1h)
Unit 3.- Anatomy. Types of fishes. Reproduction. (2h)
Unit 4.- Digestive Physiology. (1,5 h)
Unit 5.- Technology of manufacture of feeding compounds. (1,5 h)
Unit 6.- Pathology. Diseases of compulsory declaration. Rules. (2 h)

Block 2.- Specific Subjects (6 h)

Unit 7.- Genetic improvement . New species. (1h)
Unit 8.- Engineering of the facilities. Types of cages. Signaling. (2,5 h)
Unit 9.- Design of facilities. Parts of a project. (2,5 h)

Block 3.- Subject related to core rules (3 h)

Unit 10.- The Public Domain. Aquaculture concessions. Managements plans in aquaculture. (1,5 h)
Unit 11.- Environmental Impacts in aquaculture. Declarations impact proceeds. (1,5 h)

Block 4.- Aquaculture production (6 h)

Unit 12.- Sea-Bream production.(1 h)
Unit 13.- Sea- Bass production. (1 h)
Unit 14.- Corvina porduction. (1 h)
Unit 15.- Bluefin tuna production. (1 h)
Unit 16.- Molluscs production. (1 h)
Unit 17.- Structure of the aquaculture sector. I+D+i. (1 h)

518109019 Emergent technologies and control processing in food industry:

Unit 1: No Heated Emerging Technologies.

1. Introduction
2. High hydrostatic pressure.
3. Ultrasound
4. High intensity pulsed light and magnetic fields.
5. Ionizing radiation.
6. High intensity electric fields.
7. Cold plasma.
8. Other tools: chemical, biochemical and packaging tools.

Unit 2: Heated Emerging Technologies.

9. Microwave.
10. Radio frequency and ohmic heating.
11. Process control.