

CENTER FOR INTERNATIONAL PROGRAMS & SUSTAINABILITY STUDIES

COURSE NAME: Agroecology and Sustainable Food Systems

COURSE CODE: ENV 4030

TOTAL CONTACT HOURS: 60

Total contact hours: 60 hours

This syllabus is tentative and subject to change. A new copy will be provided if changes are made.

COURSE DESCRIPTION

This course examines different systems of agriculture and food production from an ecological perspective, taking into account the systemic model and integrated agroecological management, to offer answers that promote sustainability at all stages of food production.

After studying the fundamentals and most important ecological processes, diverse applications of these concepts to agricultural systems will be analyzed, within the framework of the imitation of natural systems, including ancestral and novel topics and methods and technologies in development process applicable to the course. The elements of consumption and production that affect current food production systems, the production and management of energy from alternative sources applicable in agroecology will also be analyzed and students will explore their own role in the large food production system.

Field trips will provide opportunities for direct observation and interaction in different system designs and their particular operation in Costa Rica many times applicable to international realities. Field trips also expose different approaches to food production and distribution, as well as alternative energy production in Costa Rica, and direct participation in those systems.

This course usually interacts with other CIPSS courses such as Tropical Botany and Sustainable development, among others, in order to exchange knowledge and experiences, including some joined Field Trips, lectures, and experts visits within a Systems and Integrated approaches. The topics covered are deep both theoretically and regarding experience background, students and professors usually have a lot to share about their personal experiences with agriculture and food systems, so the course demands extra class reading, and preparation for professor's lectures, outside activities, and students assignments.

Course prerequisites

It is recommended, but not mandatory, that students complete a basic biology or ecology course prior to entering this course.

Audience

This course is structured for international students attending the Study Abroad program at Universidad Veritas. However, courses are not exclusive to foreigners so a few native students could enroll in this course. Some of the courses are also taught in Spanish as part of our Bachelors in Sustainability Management.

Attendance

Students are only allowed a total of **2 nonconsecutive (back to back) absences**. The student will **fail the course if he/she has more than two absences**. Students will have a 0 on any assignment evaluated in class (presentations, evaluations, field trips, etc.) if he/she is absent unless the student presents an **official document no later than one week after the absence**. If the student presents an authoritative report to excuse the absence, he/she must submit the missed assignment on that same day. An unjustified absence to a field trip will immediately mean losing all of the points assigned to the field trip. If an official document is presented for the field trip absence students will have to present a research assignment to obtain 50% of the points. The only exception to this rule is when two-course field sessions collide in programming. Students can then opt for doing a research assignment not to lose any points on the field trip they don't attend but it must be coordinated ahead of time with the professors.

Three late arrivals to class (within the first 15 minutes) are treated as one absence. If you come to class 30 minutes late without an official justification document, it will also count as an absence.

Code of conduct

Professors have the right to expel a student from the classroom should he / she:

- 1) Is disruptive in the classroom.
- 2) Behave in a disrespectful way.
- 3) Is under the influence of alcohol or even smell like alcohol.
- 4) Is under the influence of any illegal drug.
- 5) Shows hygiene problems that may disturb other students.

Electronic devices

The use of cell phones, smart phones, or other mobile communication devices is disruptive, and is therefore prohibited during class. **Please turn all devices OFF and put them away when class begins**. Devices may be used ONLY when the professor assigns a specific activity and allows the use of devices for internet search or recording. Those who fail to comply with the rule must leave the classroom for the remainder of the class period.

Clothing and footwear requirements

It is necessary for foreign students to have clothes both for warm climate and for cold (not extreme), as well as closed shoes (hiking shoes and rubber boots if possible) since many field

trips are made to highlands, rainy zones, and sometimes to areas with the possible presence of snakes, insects, and other animals. We've never had an accident under those circumstances, but we want our students to be as comfortable and safe as possible. The appropriate clothing and footwear also facilitate the field work of this course.

This is a theoretical-practical course and it seeks to clarify the following question:

How to design efficient agroecological and food production systems that can promote and exemplify regenerative and sustainable systems management?

In order to answer this question, this course will study the following:

- Theoretical foundations of Ecology of Agriculture
- Systems approach
- Plants and environmental elements
- Systems interactions
- The design of alternative agroecological systems
- Alternative food production systems
- Soil building and organic waste management
- Integrated pest management
- Transition to sustainability and regenerative management: Permaculture and Analog Forestry.

The course will promote the following skills:

- Ability to analyze the problems of conventional agriculture and the need for sustainable food production systems.
- Ability to determine strengths, needs and improvement opportunities in agricultural systems.
- Ability to propose alternative, sustainable and regenerative designs of agroecological systems.

Some of the values and attitudes fostered among students are the following:

- Empathy with the environment
- Self-awareness
- Solidarity in relationships with others
- Equity
- Teamwork and leadership
- Systemic thinking
- Logical and communicative intelligence
- Interest in solving problems
- Interest in learning to learn

- Negotiate knowing how to inspire trust and empathy

COMPETENCIES, CRITERIA AND EVIDENCE

At Veritas University competencies are reflexive and integrated actions that respond to the professional profile and to context issues ideally and ethically through the integration of abilities, skills and knowledge. What follows are the discipline and core competencies and their correspondent key competencies and evidence of learning for this course.

Competencies	Key competences	Evidence of learning
<p>Discipline</p> <p>Integrates the best agroecological practices to propose alternative designs to agriculture and conventional food production systems, in accordance with ecological principles and taking into account the maxims of sustainability and regenerative management.</p>	<p>Analyzes complex agroecological systems and food production systems considering the use and integration of alternative techniques and methods, research, analysis and interdisciplinary diagnosis.</p>	<p>Current event presentation</p> <p>Field Trip report</p> <p>Group research and presentation</p> <p>Individual presentation</p> <p>Creative presentation</p>
	<p>Analyzes the importance of planning and emulation of natural systems in sustainable agroecological design through the integration of best practices in organic agriculture, permaculture, and analog forestry systems.</p>	<p>Current event presentation</p> <p>Field Trip report.</p> <p>Group research and presentation</p> <p>Individual presentation</p> <p>Creative presentation</p>
	<p>Applies concepts of ecology and alternative practices of agriculture, food production, and energy generation systems in the design of agroecological systems, according to the principles of sustainability and regenerative management.</p>	<p>Written report, oral presentation and sustainable agroecological system design model.</p> <p>Creative presentation</p>
<p>Generic</p>		
<p>Integrates knowledge,</p>	<p>Learning to learn</p>	<p>Written report, oral</p>

skills and attitudes to learn continuously and through one's life pursuing an efficient development in the knowledge-based society.		presentation and sustainable agroecological system design model Current event presentation Field Trip report. Group research and presentation Individual presentation Creative presentation
Builds the necessary knowledge, skills and attitudes to learn how to communicate orally and in written form in the different disciplines that make up the curriculum.	Communicate thoughts of the discipline orally, iconically, and in written form.	Current event presentation Field Trip report. Group research and presentation Individual presentation Creative presentation
Integrates the necessary knowledge, skills, and attitudes to learn teamwork and leadership techniques.	Execute teamwork and leadership.	Written report, oral presentation and sustainable agroecological system design model Group research and presentation Creative presentation
Integrates the necessary knowledge, skills and attitudes to learn interpersonal communication techniques.	Relate well to others Manage and solve conflicts Negotiate reliably and empathetically Speak responsibly Listen attentively	Written report, oral presentation and sustainable agroecological system design model Group research and presentation Creative presentation

CONTENTS

Unit 1. Problems in Agriculture

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- 1.2 Current Conventional Agriculture goals and methods.
- 1.3 Consequences of Conventional Agriculture practices
- 1.4 Heterotrophy and food chains importance in agriculture
- 1.5 Integration importance in agriculture

1.6 Sustainability of Conventional Agriculture

Unit 2. Agroecology spectrum

- 2.1 Organic agriculture principles and fundamentals
- 2.2 Organic agriculture types
- 2.3 Organic agriculture methods, practices, and certification.
- 2.4 Agroforestry
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- 2.6 Permaculture
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Unit 3. History of Agriculture

- 3.1 Aztec chinampas
- 3.2 Terracing in the Andes
- 3.3 Nomadic Herding - The Maasai example
- 3.4 Lactase persistence
- 3.5 New husbandry and the turnip introduction to Great Britain

Unit 4. Ecology in Agriculture

- 4.1 Ecology fundamentals
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- 4.4 Photosynthesis and primary production
- 4.5 Energy Production and Transfer in Agriculture
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Unit 5. Soil

- 5.1 Soil characteristics (structure, texture, color)
- 5.2 Soil formation
- 5.3 Soil biotic interactions
- 5.4 Plant nutrient acquisition and Cation Exchange Capacity (CEC)
- 5.5 Soil management: organic matter and composting
- 5.4 Soil horizons
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Unit 6. Nutrient cycling and Decomposition

- 6.1 Biogeochemical cycling
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- 6.3 Nitrogen cycle, importance, and ecological impact.
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- 6.6 Mycorrhizae
- 6.7 Decomposition fundamentals
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Unit 7. Adaptations relevant to agriculture

- 7.1 Basic plant systems and their functions
- 7.2 The process of photosynthesis and its implications
- 7.3 Photosynthesis types and agroecology
- 7.4 Allocation
- 7.5 Light adaptations
- 7.6 Temperature adaptations
- 7.7 Water adaptations
- 7.8 Tropical crops

METHODOLOGY

This course implements active methodology, in which the student is subject of its own learning at all stages. Within this methodology both inductive and deductive methods are applied as well as various techniques in an eclectic way. Research on the essential concepts of Ecology and Agroecology is encouraged, both individually and in groups, through the study of cases that exemplify concrete situations that challenge the proposals of Agroecology in the search for sustainability and regenerative systems, and exemplify the application of good agroecological practices. Likewise, different activities are used to exemplify the applications of the discipline in different contexts and to promote the ability to analyze and solve specific problems.

A project is carried out in small groups, in which a sustainable agroecological design is proposed, emphasizing efficiency by applying the knowledge covered during the course and the scientific method. Students are asked to frame the project within the field of Agroecology, but the system proposed can vary from urban gardens to school gardens, community gardens, production farms, educational farms, Permaculture systems, Analog Forestry systems, among others. The purpose of the project is to apply the concepts and applications of efficiency and regenerativity/sustainability in an agroecological design. The student must demonstrate a high level of analysis, take into account the great number of factors that must be involved in the design and make the proposal applicable to reality; that is, the design must be achievable.

During the course the expository technique is used by the professor and students, individually and in groups, always promoting the participation of students through their direct intervention in discussions, broadening concepts and analysis of the topics discussed in class. As research is a pillar of the course, the topics to be discussed and exposed in class are first researched at the bibliographic level by the students and then used and presented in group or individual work products.

The field techniques applied in field trips, as well as the direct and participatory learning is reflected in reports, in which the scientific method is also applied.

The role of the professor is to be a mediator, facilitator and counselor in the teaching and learning process, allowing the construction and self-regulation of learning by students, based on their prior knowledge and new developed abilities. The student is active, the teaching is collective and socialized, since it promotes social integration, development of group work skills, community feeling and respect, without neglecting individualization.

LEARNING STRATEGIES

The following learning strategies will be developed:

1. **Regional Current Event Presentation** consists of an oral presentation of a current topic of interest logically structured. The presentation provides structure and organization to the research, and also allows extracting the important points of a wide range of information, reinforcing analysis and synthesis abilities. Oral presentations allow the student to delve into a specific topic through research and develop communication; discussion and information organization skills. These presentations will generate a space for group discussion. The specific topics to be discussed are of free choice, referring to **national or regional agricultural issues**. Students use extra class time to research and prepare the presentation, articles and/or sources to be presented must **be approved by the professor through Canvas at least 7 days before deadline**. Each student **orally presents the researched event, a personal and research based point of view, and a generating question for discussion and analysis with the class. The approved topic with the presentation (if PPT is used) must be uploaded to Canvas at least the day before presenting**. The time for presenting is 15 minutes maximum including discussion. **This assignment is 10% of the total grade.**
2. **Field trip reports** allow the student to analyze the agroecological systems visited, both from the perspective of Ecology as well as Agroecology as a discipline that emulates nature and sustainability. The student analyzes the particular design of the site visited, the existing environmental, economic, social and design based reality and provides ideas for improvement. Each field trip has clear objectives given by the professor, specific content that will be covered, and techniques to put into practice. The report summarizes the activities covered during the trip, discusses the results of the applied techniques and compares the general observations with the theoretical content learned in class and researched by the students, includes conclusions derived from

observations and the obtained results, and recommendations are made at the application level of the visited sites and of the didactic experience. A high level of analysis and bibliographic research is expected for the preparation of the reports. There are two Field trip reports along the course, **10% each**. Lodging and main meals are covered by the course.

There are two mandatory field trips in this course, which **are not excursions nor vacations**. Only students enrolled in this course may attend. Field work can include volunteer activities in lowlands or highlands facing hot or cold weather that might be considered harsh or strenuous for students without previous experience in fieldwork. Activities can also be lectures on site provided by the site's owners, lecturers, or the course professor. Punctuality is expected for all activities including departure, return and scheduled meal times. Some of the national parks and reserves are in faraway areas of the country or places with difficult access so students who get motion sickness from long bus rides might be uncomfortable in these field trips.

Students must carry small notebooks (or phones) to write down information provided by professor, guides or project's owners, and anything they see or learn while in the field and what they think about it, especially things related to what has been or will be studied in class. Each person's notes will be unique, not only in that each person notices different things, but also interprets similar things differently. Notes help students write the field trip report, which is a formal paper that mirrors the field trip experience and learning.

Due to the nature of the course, several plant species will be identified, as well as their uses, production techniques, among other characteristics and ecology habits, this information often needs to be extended through bibliographical research. **Each report is four 1.5-spaced pages minimum (not including images or References section)** extending to a **maximum of ten pages**, depending on the amount of activities performed during the trips. This is a formal paper that follows the general format indicated for the rest of written assignments, including APA style for in-texts references and references section and **must be uploaded to Canvas on or previous deadline**.

- 3. Agroecological system design.** In the project method, students apply and build their learning through the realization of a project, in which they plan, execute and evaluate a series of activities in order to **solve a problem**. It seeks to confront the students to situations that lead them to apply what they learn to solve problems or propose improvements in the communities where they live, study, wish to live or simply wish to improve. In this way, deep analysis of current and ideally national and international problems are promoted, as well as the resolution of problems of global interest. In addition, attitudes and values necessary for collaborative work and life skills are promoted and developed. A written report is included, in which the results of the bibliographic research that accompanies each part of the project and the integration of all the elements and ideas are shown. A three-dimensional model is built with reused materials which allows visualizing the design of the system itself. Each model must be

defended to prove its importance and efficiency. The project is evaluated in phases, each one of them includes improvements and advances for the final project. This project represents a **40% of the final grade, co-evaluation (peers assessment) is applied.** Presenting time, including questions, activities, and discussion will be **20 minutes. The report must be uploaded to Canvas on deadline.**

Each group decides to integrate different elements to their project, which must be supported at all phases under the framework of **regenerativity/sustainability, integrality and efficiency** principles.

Inclusion of social and educational objectives is a must. Examples of possible projects are: educational farms (in universities, schools or other educational centers), Urban gardens, Community gardens, farms, sustainability centers, among any other possible and needed systems for the cities or the field. With the guidance of the professor different aspects must be taken into account for the project, such as the following:

- Clear problem to be assessed and "solved"
- Clear objectives.
- Clear methodology and materials.
- A realistic, approximate budget.
- Area measure and description (topography, urbanity, classical activities, climate, soil type etc.)
- Ecological description of the site and use of this description to design.
- Environmental needs of the site to be healthy and productive
- Data about the amount of people that will directly or indirectly benefit from the project
- Description of the different systems included in the design and their integration (efficiency and interconnections - Systems approach)
- Description of the expected results in a certain period of time: Environmental, economic, educational, and social impact
- Others

Several lessons of the course will be dedicated to the first designing steps of the project so that the professor can guide each group and help building the main needed ideas for the project. There will be 1 session for initial guiding, 2 sessions for revisions of project progress and a final session for project presentation. Students will dedicate extra class time to build the project.

Sessions dedicated to the project:

Session #1: The professor explains the basic elements that must be included in the project and how the scientific method is applied to the project. Students discuss possible ideas and form groups, list a preliminary list of possible sources for research.

Session#2: Each group presents the first project progress including a design draft (drawing) of the project idea, some ecological information of the site, a list of systems to include and elements to consider for implementation, a central problem to be solved through the project, three objectives that will guide the project's performance, and a basic methodology to show the "step by step" implementation plan of the project.

Professor and classmates provide observations and improvement recommendations. **(5% from total grade)**

Session #3: Each group presents the second project progress including an improved design draft (drawing) of the project idea, the improved list of elements to consider (including budget and ecological conditions), improved problem and objectives, improved methodology, a list of possible results and solutions to negative results, and explain the route of energy investment and production of the system, showing the efficiency and regenerativity of the design. Classmates and professor provide observations and improvement ideas. *By this session each group must have had acquired the majority of materials for model building from Verita's recycling warehouse* **(8% from total grade).**

Session #4: Each group presents the final model, explains its efficiency and the role of each system in accomplishing the project's objectives and central problem solving. The project is defended and the report delivered. **(20% from total grade)**

Summary of the project:

- Two project progress revisions. A PPT is not required but can be used for revisions.
- A report using Manuscript Structure (APA style)
- A 3D model built using materials from Verita's recycling warehouse. For tape, glue, scissors and other implements **talk to Diana or Pamela from CPI offices.**
- A presentation (PowerPoint/Prezi/other tools) to defend and explain the project.
- Peers assessment: 4%
- Self-assessment: 3%

4. **Group work presentation:** Group work allows developing important attitudes, values, and skills, such as tolerance, respect, solidarity, leadership, teamwork, and communication, as well as knowledge integration and equity. The assignment consists of a **research on a given topic** (delegated by the professor) and includes a **presentation** using **PPT**, Prezi, or other useful tool. Each group member must **participate actively** in research and during presentation, members of the class not presenting act as a public and with the professor randomly ask questions to the presenters about the topic. The group must **bring a generating question for class discussion** and can bring an **evaluation or interactive activity** too. Presenting time plus questions and discussion will be **20 minutes maximum, depending on the amount of students enrolled**; the presentation must be **uploaded to Canvas at least the day before presenting**. The assignment is **10% of total grade, Co-evaluation (peers assessment)** will be applied.

Each group chooses one of following topics:

A: Lactase persistence,

B: The case of the Aztec Chinampas and Terracing in the Andes,

C: Nomadic herding: the Maasai example

D: New husbandry and the turnip introduction to Great Britain.

5. **Individual presentations** are meant to develop specific skills and abilities such as research skills, analysis and synthesis, self-confidence, time management, and responsibility.

Students have the opportunity to choose a topic of their interest related to Agroecology and present it using PPT, Prezi, PowToon, or another useful presentation tool, even posters are allowed (6%). Each student also delivers a report (6%) that summarizes the research findings. Students use extra class time to research and prepare their reports and presentation. Presentation topic and sources must be approved by the professor through Canvas at least 7 days before deadline, the final presentation must be uploaded at least the day before presenting. Presenting time plus questions and discussion will be 20 minutes maximum depending on the amount of students enrolled. **Co-evaluation (3%) will be applied to this assignment which represents 15% of total grade.**

Topic examples:

- Choose an agricultural crop grown for local consumption and export in Costa Rica.
 - Climate change and agriculture
 - Case study of your interest
 - Agroecology economics
 - Agroecology policies
 - A “big” National topic, important at the moment and related to one or more topics discussed in class
 - An interesting article related to one or more topics discussed in class
 - A new technology or knowledge applied to Agroecology in a sustainable way.
6. **Creative presentation:** This is an opportunity for students to communicate a theoretical content in a creative way. Students choose a topic included in the course contents and develop it through an artistic way (painting, acting, playing an instrument/song, building up a model, creating poetry, using Information and Communication Technologies (ICT), any other creative tool. Presenting time must be between 5 and 10 minutes. Submitting a topic and **a plan for the creative presentation must be done through Canvas at least 7 days before deadline. This is a 5% activity.**

The plan must include:

- Topic and specific contents to be presented.
 - Description of the activity to be presented.
 - Description of the creative component to be implemented.
 - Explanation of why you picked the topic and artistic technique.
7. Verita's garden active work is an **opportunity to gain extra knowledge about Agriculture and 5% extra credit for the course.** Starting on **February 5th** each student can invest a **minimum of 8 hours** working on "Hueritas" garden located in zone 8. Garden working days are Tuesdays and Thursdays in the morning (9:00 am to 1:00 pm), only 5 students per day are allowed. Once a student enrolls in this activity it is assumed as **a commitment that will be sealed by a commitment contract signed by the professor and the student, if abandoned it will resemble a 5% minus in total grade.** The garden's instructor will explain the work to be done on each session which can be physical or related to the

manufacture of products or materials needed in the garden. According to the needs of the garden the instructor can shorten the amount of work hours for students without affecting their extra 5%. Students will be asked to sign up for their working dates on a calendar, any change of date due to justified eventualities must be approved by the instructor. Students are expected to follow the garden's rules:

- 1. Be punctual.**
- 2. Wear working shoes, sneakers, or other closed shoes. Sandals or flip flops are not allowed.**
- 3. Use tools carefully and leave them clean in their place when you finish.**
- 4. Collaborate with a positive and integrative attitude.**
- 5. Respect all peers and instructor at all times.**
- 6. Join the WhatsApp group that will be open for coordination purposes.**

Hueritas instructor is Mr. Emiliano Calvo (phone number: +50687307258 telemenos@gmail.com), who will create a WhatsApp group for students enrolled in the program. Deadline for signing up is January 29th. Contact Mr. Emiliano Calvo on that day for schedule arrangements.

Along the course sessions, several activities will be performed, such as group discussions, brainstorming, topic summaries, small in class research, posters and summary cards creations, expert's on specific topics visits and lectures, and laboratory activities when possible.

General format for assignments

A specific rubric is provided for each assignment, for the students to know in advance the way they will be assessed. The following are general but mandatory requirements for all written assignments:

- 12 pt. Times New Roman Arial, Century Gothic or Calibri font, in letter size pages
- 1.5 spacing
- Name, class, and date in header *
- Align margins with page borders **
- Submit electronically to Canvas platform
- References must be included in text and a references section must be included at the end of each assignment using APA style, most recent version.

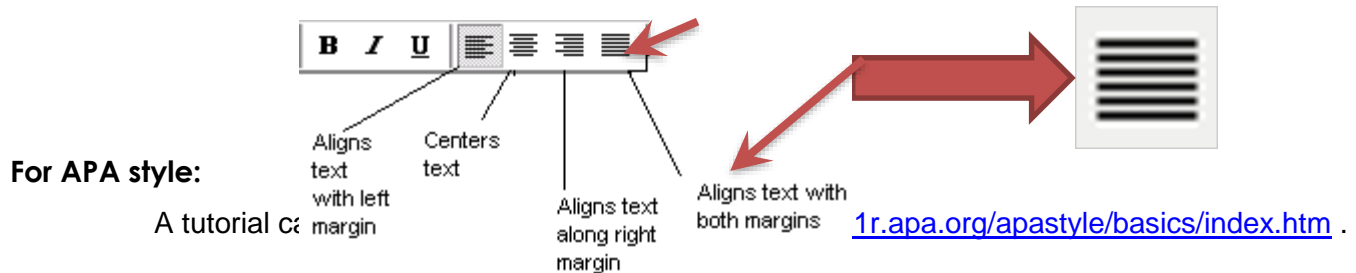
*** Header Example:**

Veritas University
Agroecology and Sustainable Food Systems
Field Trip Report #1: Organic markets' visit
Amanda Calvo Santana **January 7th, 2018**

- Use a line to separate heading from the rest of the report
- Leave a space between the header and the beginning of the text
- Do not include the header on every page, but only on the first one

All written assignments have a deadline to be sent, and will not be received after this deadline, without exceptions. It is each student's responsibility to be aware of each assignment deadline.

****Note:** Remember to use third person for all your written reports and align margins with page borders by selecting the option that aligns the text with both margins:



For website references: <http://www.apastyle.org/learn/quick-guide-on-references.aspx#Websites> or <http://blog.apastyle.org/apastyle/2010/11/how-to-cite-something-you-found-on-a-website-in-apa-style.html> .

- All pictures and images must be cited in the text (for example: “see figure 1”). Each image, figure or diagram must include a centered title at the top and a short legend briefly describing the content and the source must be added at the bottom.

All Presentations:

These aspects will always be taken into account for presentations:

- **Preparation and content:** topic relevance, knowledge assimilation, answers to classmates' and professor questions, and content deepness due to evident research.
- **Organization and style:** smoothness, independence from notes and devices, speaking clarity, slides clarity and aesthetics, text and images balance.
- **Time limit respect:** each presentation has a time limit; students will be informed about this in advance.
- **Personal opinion:** robust personal opinion reflecting serious analysis of the topic and previous research.
- **Punctuality:** presentations must be presented on the assigned date, not following this rule means a grade of 0% on that particular presentation unless the absence or lack of assignment is properly justified.

EDUCATIONAL RESOURCES

In order to guarantee good development of the course, therefore to guarantee learning, the following resources are available: an updated bibliographic database, multimedia equipment that students can use for their individual presentations; whiteboards and other school equipment for weekly sessions, and readings provided by the educator. All of these complement the suggested projects and provide the students with higher possibilities of knowledge own ship. Most of the lessons will take place in the classroom.

During independent work periods students will be able to attend the institution.

A campus library, study rooms, and computer labs are available for the students' independent work time. Free Wi-Fi connection for students, educators, and staff is provided on campus, which gives students the possibility to work not only in the library or computer labs, but also around campus.

LEARNING EVALUATION

In order to make the course or program better competencies based evaluation compiles and evaluates evidence by taking into account feedback providing pre-established criteria. The course evaluation must be aligned with the competencies and the teaching methodology. There is a rubric for each evaluation resource. Even though the rubric grants a grade, it is also a quantitative and qualitative description of the students' performance. The rubrics include the core and discipline key competences.

CRITERIA	PERCENTAGE VALUE
Current event presentation	10%
Creative presentation	5%
Group research and presentation	10%
Field trip reports (2)	20%
Final presentation ("free" topic) and report	15%
Agroecological Design Project	40%
Extra credit: Verita's garden work (8 hrs.)	
Total	100%

Rubrics to evaluate the design project of an agroecological system

Rubric for Revision #1: 5 pts. (5% of final grade)

Indicators (criteria)	Possible points	Observations
Students presented the draft (drawing or sketch) of the initial idea on time, clean, and clearly showing each element of the proposed project.	1	
Students provide ecological information of the site, a list of systems to include and elements to consider for implementation. The main ideas are clear.	1	
A central problem to be solved is presented together with three initial objectives. A methodology idea is presented, showing the idea for a "step by step" implementation plan of the project.	1	
Students defend the efficiency of the initial idea of the project and show an important research activity and preparation.	1	
The group brings prepared questions for the professor in order to improve their project for next revision.	1	

Rubric for Revision #2: 8 pts (8% from final grade)

Indicators (criteria)	Possible points	Observations
Students presented the improved draft (drawing or sketch) time, clean, and clearly showing each element of the proposed project.	1	
Students provide improved ecological information of the site, an improved list of systems to include and elements to consider for implementation, including budget. The main ideas are clear.	1	
Improved central problem and objectives are presented. A more in depth and detailed methodology is presented, showing the "step by step" implementation plan of the project.	2	
Possible results and solutions to negative results are included and detailed, the route of energy investment and production of the system, showing the efficiency and regenerativity of the design is also provided.	2	
Students defend the efficiency of the initial idea of the project and show an important research activity and preparation, including materials to be used for the model.	1	
The group brings prepared questions for the professor in order to improve their project for next revision.	1	

Rubric for Final project report: 10 points (10% of total grade)

Indicators (Criteria)	Possible points	Observations
<u>Report aspects</u>		
The report includes a header with the name of the university, the student, and the course, title of the project and a line that separates the header from the rest of the work. Even margins are used in all the body of the report.	1	
Organization of research: body of the work is structured in chapters and themes. The work consists of: Summary, indexes, introduction, background, justification, objectives (general and specific), methodology and materials, results (graphic diagram of the design), discussion, conclusions, bibliography, and annexes.	1	
The investigation has a delimitation of the topic , a clear and precise approach to the problem . A general objective is presented and between three and four specific ones, directly related to the proposed problem.	1	
The background section describes the environment in which the design will be implemented in all its dimensions, including the former and current use of the site, the most important ecological factors to be taken into account (type of climate, soil, native and current biodiversity, among others), characteristics of the community of inhabitants, as well as its cultural and economic reality.	1	
The justification section indicates the relevance of the project, provides important reasons for the design implementation, explains why it is important and presents the problem to be solved.	1	
The methodology describes the step by step implementation of the project, includes the list of materials and an approximate budget of its cost, and describes each subsystem to be implemented and the integrality between each subsystem and the general system as a whole.	1	
The discussion chapter provides a detailed analysis of the functionality of each subsystem, the application of the concept of efficiency and the integration between subsystems , considering the ecological reality of the environment in which the project will be developed. The reason for choosing each subsystem is explained and how they solve the central problem that is being solved. It describes the social, educational, and economic aspects that the project frames and the challenges that are solved with the design. The proposed design is defended with the support of the bibliography used, taking into account the concepts studied in the course for a robust analysis, which is reflected in the conclusions .	2	

The conclusions are presented in the form of a list, derive from the objectives, and include recommendations for similar future projects.	1	
The bibliographic sources follow APA style in its latest version both within the text of the report and in the bibliography chapter. At least five bibliographical sources were consulted.	1	

Rubric for project presentation and 3D model: 10 points (10% of total grade)

Model and oral presentation aspects	Possible points	Observations
Students summarize the background, problem, objectives, justification and methodology applied to the design.	2	
Students describe and defend the relevance of the different subsystems included in the design using the 3D model built, based on the concepts of efficiency, integration, and regenerativity/sustainability within and between each of them.	2	
The analysis and knowledge of the work done is reflected in the solvency of the oral expression, answers to classmates and professor questions, and the independence from written resources. Each member of the group participates on the presentation, and there's balance in the assigned parts for each member to present.	2	
The 3D model is built with reused materials; minimum size is 20 X 15 cm (model base). It accomplishes aesthetics and the design as a whole is understandable.	2	
Each component of the model is presented neatly and in detail , without patches of glue, scratches or dirt. Effort and preparation of the model is evident in the materials chosen and the buildup of the model.	2	

Co-evaluation rubric of the design project of an agroecological system (4%)

Criteria	Possible points	Observations
The responsibility was constant throughout the process of the project. The student was punctual in delivering specific contributions, meeting agreements and attendance to scheduled meetings.	1	
Theoretical and practical contributions were of the agreed quality, the investment of time and effort in the search for information, organization of work and construction of the model was fair and contributed to carry out the work successfully.	1	
The treatment with all the members was respectful, tolerant and positive throughout the project.	1	
The distribution of participation for the oral presentation, as well as the contributions for the analysis and the defense of the project were equitable , there was consent and agreement to assume the role and the tasks that were jointly decided.	1	
Students Observations:		

* Personal opinions are expected to be supported by theoretical and/or experimental argumentation.

**Evaluation specifications and rubrics must be consulted by students; the professor is not responsible for constant reminders since the information is provided since first class day.

Self-assessment rubric for Final project (3%)

Peers assessment aspects	Possible Points	Observations
I was responsible throughout the process of the project. I showed punctuality in delivering specific contributions, meeting agreements and attendance to scheduled meetings. I dedicated time and effort to the assignment. I made my research in advance searched in multiple reliable sources of information I was responsible in the preparation of my project.	1	
I provided theoretical and practical contributions of the agreed quality, I invested a fair amount of time and effort in the search for information, organization of work and construction of the model and contributed to carry out the work successfully.	1	
I treated all the members of the group respectfully, I had a tolerant and positive attitude to all throughout the project.	1	

Rubric for Field Trips

Each report is 10%; assessment is performed using the following rubric:

Indicator	Possible points	Observations
The report includes a header with the name of the university, the student, and the course, title of the project and a line that separates the header from the rest of the work. Even margins are used in all the body of the report. It presents order and cleanliness. It has good spelling and punctuation.	1	
Organization of the report: body structured according to chapters and themes: introduction, objectives (general and specific), methodology and materials, summary of activities, analysis of efficiency, integration and sustainability of each subsystem and the project as a whole, conclusions, bibliography, annexes if necessary.	1	
The summary describes all the substantive activities carried out. The introduction includes the important ecological data of the site and describes its implications, provides a general idea of the content of the report.	1	
The objectives , general and specific, of the field trip and of the application of field techniques are presented. The methodology describes the procedure followed according to the itinerary and lists the materials used.	1	
The analysis of the subsystems and of the project visited is clear and reflects the use of the knowledge gained along the course in contrast and comparison with onsite observations and the bibliography consulted. Data is presented in tables, charts and graphs according to their nature and following the APA format. Personal appraisals based on theory are presented. Proposals for improvement to the project visited are included taking into account the principles of efficiency, agroecology, permaculture, analog forestry, organic agriculture, and sustainability.	2	
The conclusions are presented in the form of a list and include recommendations based on what was discussed in the analysis chapter.	1	
The bibliographic sources follow APA style latest version both within the text of the report and in the bibliography chapter. At least three bibliographical sources were consulted.	1	
The student participated during the trip activities outdoors and indoors, showing collaborative attitude, interest, and punctuality in all activities.	1	
The student respected others and the environment at all times. Obeyed site's and course's regulations.	1	

Rubric to evaluate current event presentation

This is a **10% assignment** and is evaluated by the following rubric:

Indicator	Possible points	Observations
Preparation of the topic with at least 3 reliable and respectable sources of information (scientific journals, prestigious institutions, physical and digital newspapers, others)	2	
Relevance and topicality of the event, depth of personal analysis. The topic refers to Costa Rica or the Region.	2	
Preparation of at least one generating question for the discussion.	2	
Moderation of the participants: gives the word to each person in order, allows for the expression of points of view, and answers specific questions about the subject under investigation.	2	
Submission of the topic, consulted sources and generating question one week before the presentation.	2	

Rubric for group research and presentation

This is a 10% assignment and will be evaluated using the following rubric (**6% assessed by professor and 4% by each group members**):

Aspects assessed individually (Assessed by professor)	Possible points	Observations
Dominance on the topic is demonstrated when answering professor and peers' questions. There is balance between the amount of text and images in the presentation, and the student is independent of written material.	1	
Analysis is evidenced in the presentation as a well-established relation between the contents approached in class and the investigated information.	1	
The student presents a personal point of view about the analyzed topic, using robust foundations that reflect the research on the topic and the understanding of the article.	1	

Aspects assessed as a group (Assessed by professor)	Possible points	Observations
The presentation submission was one week prior deadline.	1	
Each member of the group participates presenting sections of the work equally. All members of the group dominate the topic.	1	
The group moderates participants and members take turns to answer questions.	1	

Peers assessment (Assessed by group members individually, the professor calculates the average)	Possible points	Observations
My peer was responsible at all times, showing up on time for work meetings, accomplishing group agreements, and fulfilling the assigned responsibilities	1	
My peer collaborated at all times actively, brought the materials and/or information required, and helped whenever necessary.	1	
My peer showed interest and a positive attitude at all times.	1	
My peer was respectful with all member of the group at all times, respected different points of view and collaborations, as well as the work performed by the members of the group.	1	
Students Observations: Please add your observations to each criterion when you assess each group member		

Rubric for Individual presentation and report (Free topic)

Presentation (10%)	Possible Points	Observations
Dominance on the topic is demonstrated when answering professor and peers' questions. The student used reliable scientific information to build the presentation.	1	
Analysis is evidenced in the presentation as a well-established relation between the contents approached in class and the researched information. The student provides clear conclusions.	2	
The student exposes a personal point of view about the topic, using robust foundations that reflect the research and understanding on the topic.	1	
There is balance between the amount of text and images in the presentation, the information is clear, the structure follows logic and organized sequence, and is aesthetic.	1	
The student speaks clearly following a logical sequence , is independent of written material and respects time limits.	1	

Peers assessment aspects	Possible Points	Observations
The information presented is in accordance with the standards requested for the assignment; it is complete and interesting, and founded in scientific reliable sources.	1	
The information is expressed fluently and clearly so it is easy to understand. The student provides robust arguments when answering questions and personal conclusions.	1	
There is balance between the amount of text and images in the presentation, the information is clear, the structure follows logic and organized sequence, and is aesthetic.	1	

Written report	Possible Points	Observations
The report includes a header with the name of the university, the student, and the course, title of the project and a line that separates the header from the rest of the work. Even margins are used in all the body of the report. It presents order and cleanliness. It has good spelling and punctuation.	2	
The bibliographic sources follow APA style in its latest version both within	2	

the text of the report and in the bibliography chapter. At least five bibliographical sources were consulted.		
Report organization: A logic sequence of ideas is used and the structure is clear (introduction, body, closure, etc.) using bullets, titles and subtitles to organize the information and separate ideas.	2	

Rubric for Creative presentation: 5%

Presentation and plan (5%)	Possible Points	Observations
The presentation plan was presented on time, and the presentation time was between 5-10 minutes.	1	
The presentation plan included a course topic and specific contents to be presented.	1	
The presentation plan described the activity and creative component to be presented.	1	
The presentation was engaging, created product is interesting, new, or helpful, making an original contribution that includes identifying a previously unknown problem, issue, or purpose.	2	

Rubric for Verita's garden work

The garden's instructor assesses the level of performance of the work for each student, each day, as follows. At the end of the course, an average will be calculated according to the student's performance.

Student: Date: Criteria:	A	NI	NA
Arrives punctually to the garden and wears appropriate clothing for working.			
Follows instructions. The student works efficiently and uses time according to what is specified by the instructor.			
Uses tools and resources carefully and leaves tools clean on their place after finishing the work.			
Works with a positive and collaborative attitude at all times.			
Contributes with questions and comments related to the different topics being learned, the student's interventions help improve the group's knowledge.			
Relates to peers and instructor with respect, showing empathy and assertive communication.			

Observations: _____

Key: A: Achieved (6 pts) NI: Needs improvement (5-2pts) NA: Not achieved (if present)

REFERENCES AND COMPLEMENTARY BIBLIOGRAFY

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- Altieri, M. A., Farrell, J. G., Hecht, S. B., Liebman, M., Magdoff, F., Murphy, B., . . . Sikor, T. O. (1995). *Agroecology, The Science of Sustainable Agriculture*. Boulder: Westview Press, Inc.
- Altieri, M. A. (1995). Organic Farming. In M. A. Altieri, *Agroecology, The Science of Sustainable Agriculture* (pp. 179-199). Boulder: Westview Press, Inc.
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- American Psychological Association. (2015). APA Style, Basics of APA Style Tutorial. *American Psychological Association*. Retrieved from <http://flash1r.apa.org/apastyle/basics/index.htm>
- Gliessman, S. R. (2007). *Agroecology, The Ecology of Sustainable Food Systems*. Boca Ratón: CRC Press.
- Hecht, S. B. (1995). The Evolution of Agroecological Thought. In M. A. Altieri, *Agroecology, The Science of Sustainable Agriculture* (pp. 1-19). Boulder: Westview Press, Inc.
- Hemenway, T. (2009). *Gaia's garden: A guide to Home-scale Permaculture* (2nd ed.). Vermont: Chelsea Green Publishing.
- Hemenway, T. (2015). *The Permaculture City: Regenerative design for urban, suburban, and town resilience*. Vermont: Chelsea Green Publishing.
- Magdoff, F. (1995). Soil Quality and Management. In M. A. Altieri, *Agroecology, The Science of Sustainable Agriculture* (pp. 349-364). Boulder: Westview Press, Inc.
- Morrow, R. (2016). *Earth user's guide to Teaching Permaculture* (2nd ed.). Hampshire: Permanent Publications.
- Norgaard, R. B., & Sikor, T. O. (1995). The Methodology and Practice of Agroecology. In M. A. Altieri, *Agroecology, The Science of Sustainable Agriculture* (pp. 21-39). Boulder: Westview Press, Inc.
- Vandermeer, J. H. (2011). *The Ecology of Agroecosystems*. Sudbury: Jones and Barlett Publishers International.

These texts will be available in the library. Specific sections from these texts and readings from other sources will be assigned in class.

CHRONOGRAM (this chronogram can change according to the course needs)

Week	Key competence	Content	Evidence of learning
1	<p><u>The work on key competences will be assumed as an integrated development along the course.</u></p> <p>Analyzes complex agroecological systems and food production systems considering the use and integration of alternative techniques and methods, research, analysis and interdisciplinary diagnosis.</p>	<p>Introduction to each other and to course</p> <p>Unit 1. Problems in Agriculture</p> <p>1.1 The Green Revolution: brief history of conventional agriculture</p> <p>1.2 Current Conventional Agriculture goals and methods.</p> <p>1.3 Consequences of Conventional Agriculture practices</p>	<p>Course introductions, syllabus and outline reading.</p> <p>Professor's exposition.</p> <p>Brainstorming activity.</p> <p>Group topic analysis.</p>
2		<p>Unit 1. Problems in Agriculture</p> <p>1.4 Heterotrophy and food chains importance in agriculture</p> <p>1.5 Integration importance in agriculture</p> <p>1.6 Sustainability of Conventional Agriculture</p> <p>Unit 2. Agroecology spectrum</p> <p>2.1 Organic agriculture principles and fundamentals</p> <p>2.2 Organic agriculture types</p> <p>2.3 Organic agriculture methods, practices, and certification.</p>	<p>Brainstorming activity.</p> <p>Professor's exposition.</p> <p>Mental map and posters activity.</p> <p>Group topic analysis.</p> <p>Topic summary-revision</p> <p>Brainstorming activity.</p> <p>Professor's exposition.</p> <p>Group topic analysis.</p>
3		<p>Unit 2. Agroecology spectrum</p> <p>2.4 Agroforestry</p> <p>2.5 Analog Forestry</p> <p>2.6 Permaculture</p> <p>2.7 Organic Agriculture in Costa Rica</p>	<p>Professor's exposition.</p> <p>Group topic analysis.</p> <p>Current event presentation</p> <p>Verita's garden visit</p>

<p>4</p>	<p>Analyzes the importance of planning and emulation of natural systems in sustainable agroecological design through the integration of best practices in organic agriculture, permaculture, and analog forestry systems.</p>	<p>Unit 2. Agroecology spectrum 2.6 Permaculture (continuation) Design Project Session #1 2.8 Analog Forestry</p> <p>Unit 3. History of Agriculture 3.1 Aztec chinampas 3.2 Terracing in the Andes 3.3 Nomadic Herding - The Maasai example 3.4 Lactase persistence 3.5 New husbandry and the turnip introduction to Great Britain</p>	<p>Design Project Session #1 Permaculture observation activity at Verita's garden (Design introduction) Topic summary-revision Analog Forestry lecture and design activity. Group Research Presentations Topic summary-revision</p>
<p>5</p>		<p>Unit 4. Ecology in Agriculture 4.1 Ecology fundamentals 4.2 Ecological interactions 4.3 Forms of energy and entropy 4.4 Photosynthesis and primary production 4.5 Energy Production and Transfer in Agriculture 4.6 Energy costs and efficiency in Agriculture</p>	<p>Brainstorming activity. Professor's exposition. Group work: classification summary cards/mental map Current event presentation Group analysis of the topic. Kahoot activity.</p>
<p>6</p>		<p>Unit 5. Soil 5.1 Soil characteristics (structure, texture, color) 5.2 Soil formation 5.3 Soil biotic interactions 5.4 Plant nutrient acquisition and Cation Exchange Capacity (CEC)</p>	<p>Brainstorming activity. Professor's exposition. Current event presentation Group work: research and results' sharing activity.</p>

	Applies concepts of ecology and alternative practices of agriculture, food production, and energy generation systems in the design of agroecological systems, according to the principles of sustainability and regenerative management.	5.5 Soil management: organic matter and composting 5.4 Soil horizons 5.5 Soil orders	
7		Unit 5. Soil (continuation) 5.5 Soil management: organic matter and composting: Verita's garden activity	Brainstorming activity. Professor's exposition. Kahoot activity. Verita's garden activity (according to the needs of the garden). Project development session Topic summary-revision
8		Unit 6. Nutrient cycling and Decomposition 6.1 Biogeochemical cycling 6.2 Macronutrients and Micronutrients 6.3 Nitrogen cycle, importance, and ecological impact. 6.4 Phosphorus cycle importance, and ecological impact. 6.5 Potassium cycle importance, and ecological impact.	Brainstorming activity. Professor's exposition. Expert visit (on any topic of the course previously covered) or Film analysis. Field Trip Report #1
9		Unit 6. Nutrient cycling and Decomposition 6.6 Mycorrhizae 6.7 Decomposition fundamentals 6.8 Decomposition processes 6.9 Compost Systems	Brainstorming activity. Professor's exposition. Work on Verita's garden: Compost or other associated systems system Project development session and Draft presentation
10		Unit 7. Adaptations relevant to	Professor's exposition.

		agriculture 7.1 Basic plant systems and their functions 7.2 The process of photosynthesis and its implications 7.3 Photosynthesis types and agroecology 7.4 Allocation 7.5 Light adaptations 7.6 Temperature adaptations 7.7 Water adaptations 7.8 Tropical crops	Group analysis of the topic. Topics summary
11		Student's chosen topics	Individual presentations Field Trip report #2 delivery
12		All topics integration into project's presentation. Course closure	Final project presentation: Written report, oral presentation and sustainable agroecological system design model.

General observations

The student must conform to the provisions of the Veritas "Reglamento de Régimen Estudiantil". The rulebook is available for downloading at <http://autogestion.veritas.cr/>