CENTER FOR INTERNATIONAL PROGRAMS & SUSTAINABILITY STUDIES
Course name: TROPICAL BOTANY: USEFUL PLANTS WORKSHOP
Course code: ENV 3150
Total contact hours: 60 hours

Course description

This course will provide students with a general overview of Neotropical useful plants. Students will gain insight about basic botanical concepts and will be able to explore a variety of tropical ecosystems and life zones, their flora and the multiple and complex ecological interactions that can be found in these areas, as well as the most important uses of plants in the Neotropics. Costa Rica is a tropical country with an immensely rich biodiversity and for this reason a very representative area to these studies. Emphasis will be given to the most common plant families in Costa Rica, but other Neotropical families will be discussed as well.

The course includes four laboratory practices about Phytomorphology (Plant Morphology), Plant reproduction, and Costa Rican plant diversity. Activities during lab sessions include observation, dissection, and plant identification, no experiments are conducted. Students also learn to mount herbaria botanic samples during the course.

Field trips provide an important experience with different Neotropical ecosystems and the Flora diversity of Costa Rica, where important plant adaptations and ecosystemic interactions are easily observed. A Field practice using quadrants and/or transects to compare plant diversity and forest strata could be included in one of the field trips during the course, depending on the sites visited and weather conditions.

This course usually interacts with other CIPSS courses such as Agroecology 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 required, that students complete a basic biology 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 and cold climates (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:

What are the most important botanical characteristics of tropical plants represented in Costa Rica, their traditional and new trends for their use?

In order to respond the query, we will study the following generative topics:

- Brief history of Botany
- Basic Phytomorphology
- Basic Phytoecology (Plant Ecology)
- Classification and basic botanical nomenclature
- Habitats and botanical adaptations of the Neotropics
- Sexual and asexual reproduction in plants
- Plant metabolism
- Elements of botanical identification *in situ* and *ex situ*
- Plant diversity of Costa Rica (main plant families)
- Conservation and anthropogenic intervention

The course will promote the following skills:

- Ability to identify basic characteristics useful in plant identification and plant uses recognition.
- Ability to discuss the importance of botanical diversity of the Neotropics regarding sustainability management.
- Ability to identify various anthropological activities that threaten botanical diversity in the Neotropics.
- Capacity to promote the proper use of tropical plants in Costa Rica and the integration of diverse disciplines for their management.

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

- Systemic thinking
- Logical and communicative intelligence
- Interest in solving problems
- Interest in learning to learn
- Connect well with others
- In depth listening

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. 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
Discipline Analyzes important morphological and ecological characteristics of Neotropical plants	Analyzes the importance of plant morphological, reproductive, metabolic and ecosystemic characteristics, as well as plant properties important for botanical applications in	Laboratory Practice Reports Project presentation Scientific article analysis Field Trip Reports Individual presentations. Verita's garden active work.

to promote their proper use and conservation, in accordance with the Botany science field.	diverse academic and economic fields.	
	Discusses the importance of studies regarding properties of botanical species and their implications on scientific, social, economic and sustainability activities.	Laboratory Practice Reports Project presentation Scientific article analysis Field Trip Reports Group and individual presentations. Verita's garden active work.
	Applies basic botanical knowledge to the use of diverse Neotropical plants properties, and the promotion of their conservation.	Laboratory Practice Reports Project presentation Scientific article analysis Field Trip Reports Group and individual presentations Verita's garden active work.
Core/Generic		
Integrates knowledge, skills and attitudes to learn continuously and through one´s life pursuing an efficient development in the knowledge-based society.	Learning to learn	Laboratory Practice Reports Project presentation Scientific article analysis Field Trip Reports Group and individual presentations Verita's garden active work.
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.	Laboratory Practice Reports Project presentation Scientific article analysis Field Trip Reports Group and individual presentations
Integrates the necessary knowledge, skills, and attitudes to learn teamwork and leadership techniques.	Execute teamwork and leadership.	Laboratory Practice Reports Project presentation Scientific article analysis Field Trip Reports Group and individual presentations Verita's garden active work.
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	Laboratory Practice Reports Project presentation Scientific article analysis Field Trip Reports Group and individual presentations Verita's garden active work.

COURSE CONTENT

Unit 1. Botany Fundamentals

1.1 History of the study of plants

1.2 Botany as a science

1.3 Phyto Ecology fundamentals

1.4 Primary and secondary succession

1.5 Interactions: competition, mutualism. parasitism, commensalism.

Unit 2. Plant Morphology

2.1 Phytomorphology as a science

2.2 Plant systems: The roos system and the shoot system

2.3 Morphological adaptations

Unit 3. Plant Reproduction

3.1 Asexual Reproduction

3.2 Sexual reproduction: mitosis and meiosis

3.3 Reproduction cycles in Bryophytes, ferns and allies

3.4 The life cycle of Gymnosperms.

3.5 Basic structure of the flower, symmetry and types of flowers

3.6 The life cycle of Angiosperms.

3.7 Pollination mechanisms

3.8 Fertilization and germination: fruits and seeds

3.9 Seed dispersal mechanisms

Unit 4. Plant Metabolism

4.1 The plant cell

4.2 Photosynthesis and Cellular Respiration

4.3 Secondary metabolism: plant defenses

Unit 5. Nomenclature and classification

5.1 Classification and nomenclature

5.2 Bryophytes

5.3 Seedless vascular plants

5.4 Gymnosperms

5.5 Angiosperms

5.6 On-site identification

5.7 Ex situ identification

5.8 Specimen Preservation Techniques

5.9 Importance of herbaria

Unit 6. Plant Diversity in Costa Rica

6.1 Plant families represented in Costa Rica

6.2 Usefulness of Costa Rican species and their ecological importance

6.3 Important Neotropical crops

Unit 7. Habitat and adaptations

7.1 Biomes distribution and classification factors

7.2 Tropical rainforest

7.3 Tropical Dry Forest

7.4 Tropical montane forest

7.5 Tropical Savannas

7.6 Tropical Deserts

7.7 Páramo

7.8 Mangroves

Unit 8. Anthropogenic intervention and conservation

8.1 Entities in charge of conservation and environmental protection in Costa Rica

8.2 Natural and anthropogenic impacts on tropical flora: causes and consequences

8.3 Indigenous populations' use of plants

Topics for group presentations:

1. Natural and Human Impacts on Flora
2. Indigenous populations and forest use
3. Value of tropical forests
4. Causes of and consequences of tropical forests destruction
5. Forest fragmentation and conservation
6. Development and conservation

METHODOLOGY

This course implements active methodology, in which the student is subject of it's own learning at all stages. Within this methodology both inductive and deductive methods are applied as well as various techniques in an eclectic way. The student learns to deepen the importance of Botany by analyzing the scientific theory and history of this discipline and the implementation of applied botany.

Research on the essential concepts of botany is promoted, both individually and in groups, through laboratory practices that deepen morphological, physiological and diversity aspects of Costa Rican flora. Field trips allow direct student interaction with biodiversity and the reality of conservation of various ecosystems present in Costa Rica, for the analysis of the importance and applications of this science in sustainability. The analysis of scientific botanical articles provides an

updated perspective of the advances and applications of this science, and encourages group participation, discussion, and analysis.

The Project Based Learning (PBL) "seeks to confront students to situations that lead them to rescue, understand and apply what they learn as a tool to solve problems or propose improvements in the communities where they develop" (translated from Fundación Educación para el Desarrollo - Fautapo, 2009, pp. 27-29). The contents addressed are significant since they represent real situations and problems, the activities allow the search of information and the construction of own knowledge, favoring knowledge retention and transfer. The conditions under which the projects are addressed enable the student to develop collaborative skills rather than competence, and enhance skills in productive work, autonomous learning and continuous improvement.

Along the course the expository method is used both by the professor and by students, individually and in groups, always promoting the participation of the students through their direct intervention in discussions, extension of concepts and analysis of the topics exposed. Since research is a pillar of the subject, the subjects to be discussed and exhibited in class and in the different assignments are firstly investigated at a bibliographic level by the students as a prerequisite to present group and individual work products. The scientific method is applied in all assignments and in laboratory work.

The role of the professor is to mediate, facilitate and guide the teaching and learning process, allowing students to build and self-regulate learning, based on their previous and significant knowledge; the student is active, the teaching-learning process is collective and socialized, as it fosters social integration, the development of group work skills, community feeling and respect, without neglecting individualization.

The Information and Communication Technologies (ICT) represent tools of continuous use in the course.

Learning strategies

The following learning strategies will be developed:

1. **Analysis of botanical scientific articles** provides an updated perspective of scientific and technological progress and applications, and encourages group participation and discussion.

   Each student searches and chooses a **scientific article**, reads it, analyzes it, deepens the search if necessary, and **orally** presents it to the class, including a **summary** of the central topic, methodology, results, discussion, and conclusions, plus a **generating question** to encourage **group discussion**. The subject is free but must be closely related to the course topics, the professor will provide an on-line folder with several articles as options for students, but choosing one of those is not mandatory. One article analysis per student is required, the presentation is **5% of the total grade**, and a formal presentation (PPT) is not required but allowed. Presenting time plus questions and discussion will be **10 minutes maximum**. The original article(s) must be **sent to the professor for approval at least 1 week before presentation deadline.**

2. **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 from Unit 8 called **"Anthropogenic intervention and conservation"**, and includes a **presentation** using PPT, Prezi, or other useful tool, no report is required, only the presentation. Each group member must participate actively during research and presentation, the idea is to do it as a group so splitting the topic into sections for each participant is not recommend. Members of the class not presenting act as a public and together with the professor ask questions to the presenters about the topic. These questions will be asked randomly. Presenting time plus questions and discussion will be **20 minutes maximum**, depending of the amount of students enrolled; the assignment is **10% of total grade. The presentation must be uploaded to Canvas at least the day before presenting.**

3. **Individual presentations** are meant to develop specific skills and abilities in the student, such as research skills, self-confidence, time management, and responsibility. At the same time, students have the opportunity to choose a topic of their interest, and present it the way they want, which makes the experience significant.

   Each student prepares a **presentation** through the course using PPT, Prezi, PowToon, or another useful presentation tool, even posters are allowed. No report is required, only the presentation.

   The content of the presentation is guided by the different topics the course addresses, it must be related to any subject **concerning tropical plants**, but features, facts, and processes of personal interest can be included, as long as they are related to the course. If the student chooses a specific plant to research about, it must include the specimen botanical (taxonomic) classification and important ecological information, morphological descriptions of the traits used for identification, conservation status, plant properties and uses, plus other elements of student's interest. Students use extra class time to research and prepare the presentation.

   Presentation topic and sources must be **approved by the professor (topic and sources) at least 2 weeks before deadline**. The presentation must be **uploaded to Canvas the day before presenting.**

   Presenting time plus questions and discussion will be **20 minutes maximum** depending on the amount of students enrolled. **Co-evaluation (peers-assessment) and self-assessment** will be applied to this assignment which represents **10% of total grade.**

4. **Individual project:** each student chooses a Neotropical plant in Costa Rica, investigates basic botanical aspects and applications of that plant's properties in various fields (medicine, food, construction, others) and one or more fields of interest to work on. Accompanying the bibliographical research, a **product** must be **elaborated from the chosen species**, **according to its properties** and the available research (articles, books, interviews, among others), and a **herbarium sample** is mounted and presented. The result of the project is evaluated as **a specific product made from the plant, a botanical sample for herbarium and a presentation**. The project is developed **along the course**, the professor

guides the process and assesses the results, self-assessment and co-evaluation (peers-assessment) are also performed. Students are encouraged to choose easily accessible species within the central valley or at sites visited during field trips, for which the university will process the corresponding collection permit, collection is prohibited within protected areas. Presenting time plus questions and discussion will be **20 minutes maximum, depending of the amount of students enrolled**. The project represents **35% of total grade.** Several class sessions will be dedicated to check and guide the project advances, as follows:

- **Session #1:** The professor explains the basic elements to be included in the project and how the scientific method is applied to it, points out possible research sources to find the plant students want to work with. Students work on preliminary ideas and start with the delimitation of a central problem they would like to solve through the project.
- **Session #2:** Revision #1(5%): Students present the first project progress including: the central problem to be solved, a list of 3 possible objectives to reach, a 1 paragraph preliminary justification for the project, a list of at least 3 possible plants to research, a list of properties of the chosen plants, a list of locations where the plants can be found, the type of product they want to create, and a list of possible sources to research on. A simple table using Excel or Word is recommended to organize these elements, upload the document to Canvas at least the day before presenting it, the content will be discussed in class on deadline.
- **Session #3:** Revision #2 (10%): Students present the second project progress including: a delimited central problem to be solved, 3 objectives to reach, a 2 paragraphs justification, the botanical classification including common and scientific name of plant they decided to research on, origin, distribution, and conservation status; the type of product (s) they will create, a list of properties of the plant related to the product they will create, the location they will use to collect samples, a list of scientific sources to continue research, the procedure (s) to create the product (s). During or previous this session the professor explains the proper procedure to collect, dry, and mount botanical samples, and delivers the botanical paper for plant mounting. A simple table using Excel or Word is recommended to organize these elements, upload the document to Canvas at least the day before presenting it, the content will be discussed in class on deadline.
- **Session #4:** Project presentation (20%): Each student presents the final mounted sample and created product (s), showing the project elements specified throughout the process. Classmates and professor assess each project. Presentations must be uploaded to Canvas on deadline (before presenting).

5. **Field trips** allow students to analyze the ecosystems visited from an ecological perspective and using botanical analysis of the specimens found on site, allow students to apply and analyze the concepts learned in class while having a direct experience with the ecological interactions present in the country, and learn from them in an active way. Field trips promote students' assimilation, reflection and the internalization of knowledge, sensitizing through observation and interaction. In addition, the theory addressed in class will be extensively exemplified and analyzed in the sites visited. This process promotes a critical thinking and put into practice the capacity to make decisions during the process of learning to learn.

Field trips are assessed **as reports**, in which the scientific method is applied, elaborated in **small groups** of two or three participants, summarizing the activities covered during the trip, discussing the results of the applied field techniques, and contrasting general observations against theoretical content learned in class and researched individually. Conclusions derive from observations and the results obtained. A **high level of analysis** and **bibliographical research** is expected for the elaboration of the reports, which represent a **20% of total grade.**

There are two mandatory field trips in this course, which are not excursions nor vacations. Only students enrolled in this course may attend. Lodging and main meals are covered by the course. Field work can include volunteer activities in lowlands or highlands **facing hot or cold weather,** activities such as trail cleaning, late night species monitoring, long walks on beaches or dense vegetation areas and other tasks 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 be on time for all field trip related activities including departure, return and scheduled meal times. Although many of the reserves and parks have nearby modest lodge accommodations some of the stations or research areas might require tent lodging.

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. **Examples** for reports structure are provided on Canvas.

6. **Laboratory practices** represent learning and analysis spaces in which the scientific method is applied; they stimulate the capacity of observation, analysis, collaboration and organization. The practices allow detailed observation of plant structures important for identification and use both at macro and micro level using laboratory resources such as stereoscopes and microscopes.

   Each practice has specific objectives and a specific methodology to follow previously established by the professor. Three topics are analyzed: one session for Phytomorphology,

one for sexual and asexual reproduction and two for diversity of Costa Rican flora. Fresh samples are provided by the professor or can be requested from the students. In addition, fixed samples and plates are used during lab sessions to compare and contrast structures widely studied in botany.

The Phytomorphology and reproduction practices are not quantitatively assessed, but they are considered part of the formative process and evaluation of the course, they represent the anteroom for laboratory practices of Costa Rican Flora Diversity; Phytomorphology and plant reproduction knowledge gained in the previous sessions is applied to the identification of the unique characteristics of each species. In addition to the practical activities and professors' guidance during the lab time, students are expected to research about the botanical families and/or species of the specimens observed in class in order to gain general and specific knowledge about them, and to recognize special characteristics that give plants useful properties and unique characteristics. These are all basic activities when studying plants. The reports represent a **20% of the total grade**. **Examples for reports structure and more details are provided on Canvas.**

Lab practice #1: Plant Morphology

Description: The purpose of this practice is to analyze vegetative structures in different groups of plants, such as Angiosperms, ferns and allies, and Gymnosperms when possible. Students provide a series of fresh samples that include structures from shoot and root systems of different plants. The professor provides a lecture to explain the main features to analyze, draw, and label. Samples are dissected to understand the inner Phytomorphology. The professor will also provide fresh samples for the students to observe, dissection microscopes, microscope, and basic lab materials required for the activity. Students draw, describe, and label the samples; as well as prepared slides of specific plant structures to be observed with the microscope; these structures also must be drawn, labeled, and described. The professor will provide explanations about the botanical families, species, uses, ecological aspects, among other important features related to the samples observed and studied; students are expected to take notes during labs for further study and individual research.

Lab practice #2: Plant Reproduction (sexual and vegetative)

Description: The purpose of this practice is to analyze reproductive structures in different groups of plants (Angiosperms and ferns mainly, Gymnosperms are included when possible). The analysis includes all floral parts from different types of flowers, as well as fruits and seeds, bulbs and rhizomes; samples are dissected to understand the inner Phytomorphology. The professor provides a lecture to explain the main features to analyze, draw, and label.

The professor also provides fresh samples for the students to observe, dissection microscopes, microscope, and basic lab materials required for the activity. Students draw, describe, and label the samples; as well as prepared slides of specific plant structures to be observed with the microscope; these structures also must be drawn, labeled, and

described. The professor will provide explanations about the botanical families, species, uses, ecological aspects, among other important features related to the samples observed and studied; students are expected to take notes during labs for further study and individual research.

Lab practices #3 and #4: Neotropical Plant Diversity

Description: The purpose of this practice is to identify and describe different Neotropical plant species present in Costa Rica. The professor provides a lecture to explain the main features to analyze, draw, and label. Samples are dissected to understand the inner Phytomorphology.

The professor provides fresh samples for the students to observe, dissection microscopes, microscope, and basic lab materials required for the activity. Students draw, describe, and label the samples. There will be explanations about the botanical families, species, uses, ecological aspects, among other important features related to the samples observed and studied; students are expected to take notes during labs for further study and individual research.

7. **Verita's garden active work** is an opportunity to gain extra knowledge about plants' properties, growth, and management, as well as to gain 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 mornings (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 teleminos@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 non-evaluated learning activities will be performed, such as group discussions, brainstorming, topic summaries, small in class research and result shearing, 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 requirements for all written assignments:

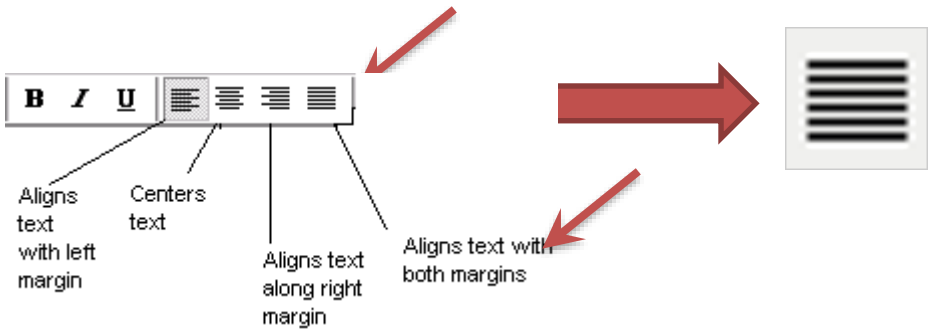
- 12 pt Times New Roman Arial, Century Gothic or Calibri font, in letter size pages
- 1.5 spacing
- Name, class, and date in header *
- Align margins with page borders **
- Submit electronically to Canvas platform
- References must be included in text and a references section must be included at the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

- A tutorial can be found in the following link: http://flash1r.apa.org/apastyle/basics/index.htm

    - 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.

For 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.

RUBRIC	PERCENTAGE VALUE
Individual presentation	**10%**
Group research and presentation	**10%**
Article presentation and discussion	**5%**
Field trip reports	**20%**
Laboratory reports	**20%**
Botanical sample and useful products Project	**35%**
Extra credit: Verita's garden work (8 hrs.)	
TOTAL	**100%**

Rubrics for Final Project

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

Indicators (criteria)	Possible points	Observations
The student presented the **central problem** to be solved, **3 possible objectives** related to the problem, and a **1 paragraph preliminary justification** for the project. The main ideas and relation between the elements are clear.	**1**	
The student provided a list of at least **3 possible plants** to research, and a list of **properties** of the chosen plants. The main ideas and relation between the elements are clear.	**1**	
A list of **locations** where the plants can be found is provided. Research on this aspect is evident.	**1**	
The type of product (s) to create is provided, the investment of time and effort in research about the product creation procedures and properties is evident. A list of sources to continue research is provided.	**1**	
The student brings prepared questions for the professor in order to improve the project for next revision.	**1**	

Rubric for Revision #2: 10 pts. (10% of final grade)

Indicators (criteria)	Possible points	Observations
The student presented the **central problem** to be solved fully delimited, **3 specific objectives** related to the problem, and a **2 paragraphs justification** for the project. The main ideas and relation between the elements are clear.	**3**	
The student provided the **complete botanical classification** of the chosen plant, origin, distribution, and conservation status, the **type of product** (s) to create, and a list of **properties** of the plant related to the product. The main ideas and relation between the elements is clear.	**3**	
A **location (s)** where the plant will be collected is provided, as well as the **procedure** (s) to follow for product creation. Research on this aspect is evident.	**2**	
A list of **sources** to continue research is provided. The student brings prepared **questions** for the professor in order to improve the project for next revision.	**2**	

Rubric for project presentation: 20% of total grade

Product, sample, and presentation aspects (12%)		
Criteria	**Possible points**	**Observations**
The **information** presented includes clear problem delimitation, 3 clear specific objectives related to the problem, and justification showing the importance and relevance of the project.	**1**	
The **content** includes the complete botanical classification of the specimen, its origin and distribution, conservation status, and its main properties applied to various fields, emphasizing the field of applicability that the student chose.	**2**	
Research findings are presented in a **fluid** way, capturing the attention of the observers. The information is presented according to a **logical order** and using language according to the subject and the course level.	**1**	
Dominance on the topic is demonstrated when answering professor and peers' questions. **Analysis** is evidenced in the presentation as a well-established relation between the contents approached in class and the researched information. There is balance between the amount of text and images in the presentation, and the student is independent of written material.	**2**	
The **process** regarding the product (s) elaboration is explained step by step as well as the importance of each step. The utility of the product resembles the research performed along the project. The student brings the product to class and demonstrates its use. The investment of time and effort in the product presented is evident.	**2**	
The **botanical sample** meets the requirements studied in class: the parts of the plant are complete and set on paper so that it is possible to clearly observe its morphology; reproductive structures (flower and / or fruit) are present, leaves were arranged in a way that both the beam and the underside and their arrangement (opposite, alternate, whorl, etc.) are clearly visible. The sample is properly dried, it is not humid (or showing mold)	**2**	

and it is not burnt or over dried; there are no glue patches anywhere, and the paper is clean and wrinkle free.		
The **label** is clean and without wrinkles or blemishes, it was stuck in the lower right corner of the herbal paper. The information on the label includes: name of the person collecting, place of collection, scientific name correctly written according to the botanical nomenclature, common name, botanical family, collection site coordinates and important ecological observations (surrounding vegetation, type of ecosystem, sighting of herbivory pollination, dispersion or others).	**2**	

Peers assessment aspects (3%)	**Possible points**	**Observations**
The information presented is in accordance with the **standards requested** for the project, it is complete, the information is interesting and useful and the presentation is balanced and not overloaded with text.	**1**	
The information is expressed **fluently**, so it is easy to understand. The student speaks **clearly**, **answers** with robust arguments the questions asked and defends the validity and relevance of the project.	**1**	
The **product** reflects effort and dedication, responds to the approach of the problem and the objectives of the project. It explains the step by step of the elaboration of the product. The **botanical sample** responds to the requirements specified for the project.	**1**	

Self-assessment aspects (5%)	**Possible points**	**Observations**
I dedicated time and effort that the project demanded since the beginning of the course, I did not wait the deadlines to prepare the various assignments.	**1**	
I delivered improvements on time, and made the necessary consultations throughout the course, according to the specific moments dedicated for it. I was open at all times to receive observations and indications in case of improvement opportunities.	**1**	
I made my research in advance searched in multiple reliable sources of information and consulted experts when necessary. I was responsible in the preparation of my project.	**1**	
I prepared the product of the project, the presentation and the botanical herbarium sample according to the indications of the professor and project requirements.	**1**	
I followed the indications regarding collection sites and avoided plagiarism at all times.	**1**	

Rubric for Field Trip reports

Indicator	**Possible points**	**Observations**
The report includes a header with the name of the university, name of the student, name of the course, title of the work and a line that separates it from the rest of the work. The report is clean and organized, and shows good spelling and punctuation.	**1**	

Organization: body of the work is structured showing chapters and topics. The work consists of: introduction, summary of activities, objectives (general and specific), methodology and materials, list of observed species and associated uses and ecological importance as analyzed during the tour, conclusions, bibliography, and annexes.	**1**	
The **summary** describes all substantive activities performed. The introduction includes the important ecological data and description of the site and describes its implications; it provides a general idea of the content of the report. The methodology describes the procedure followed according to the itinerary and lists the materials used.	**2**	
The general and specific **objectives**, the activities and techniques applied in the field are presented. **Conclusions** are presented in a list, and include academic content and personal opinions based on analysis and learning.	**2**	
The **list of specimens** observed in the field respects the botanical nomenclature. The **analysis** is clear and reflects the use of the topics covered in the course, contrasting and comparing them with the field observations and the bibliography consulted. The data is presented in tables and graphs according to their nature and using APA style. Personal **opinions** based on theory are presented.	**2**	
The **bibliographical sources** are presented using **APA** style last version both inside the body of the report and in the bibliography section. At least three bibliographic sources were consulted.	**1**	
The student was punctual to all activities, showed a collaborative and interested attitude, and was always respectful to the environment and other people.	**1**	

Rubric for laboratory reports

Laboratory practices are learning and analysis spaces in which the scientific method is applied. Each practice has specific objectives and a specific methodology to follow, previously established. Three topics are analyzed: one session for Phytomorphology, one for sexual and asexual reproduction and two for diversity of the flora of Costa Rica. The Phytomorphology and reproduction practices are not quantitatively assessed, but they are part of the formative assessment, they represent the anteroom for laboratory practices of Costa Rican Flora Diversity, in which what is learned in the practices is later applied to the identification of the unique characteristics of each species. Two laboratory practices are assessed each with a value of 10%, by observing The first two labs are meant to prepare students for the last two ones, help them acquire expertise in drawing, labeling, recognizing, and describing fresh samples. These two first laboratories do not require a formal report delivery. Drawings of the two last lab practices must be delivered to the professor, together with the written lab report (by e-mail) following scientific articles/reports structure and format and APA style for references.

Important instructions for students regarding the different sections of this report are:

1. **Introduction**: between half and 1 page (1.5 spaced). Allows the reader to know the general content of the paper, it includes a summary of each section written in an understandable and logic way. Use a scientific article from a recognized Journal as a reference if you are not sure about the structure of the introduction.

2. **Objectives**: 1 general and 2-3 specific. Lab objectives will be provided by the professor during the lab, include them in your report.

3. **Methodology and materials**:
- Describe what was done during the lab. - Make a list of the materials used during the lab (stereoscope, pencil, paper, fresh samples, etc.) 5 pts
- Include a list of all the specimens (use scientific names) presented in the lab and include the family name for each one of the plants, use a table if you need to.

4. **Results**: your drawings and observations (labeled structures, special personal observations, etc) are your lab results. In this section:
- Choose 3 species studied during the lab. For each species you chose, research and provide a general botanical description of the family and the species (research on reliable internet sources, books, science journals, etc).

5. **Discussion and conclusions**: This section is the most important of your report. It is meant to compare and contrast your observations against the information provided in literature. Find differences and similarities between your observations and the information researched about the specimens/genera/families. You are expected to read after class about the families and species observed in order to be able to provide a list of conclusions about morphology, uses, distribution, among others. The discussion must be written in prose and conclusions as a list. 6. References: Use APA style. Use only reliable scientific sources.

The last two laboratory reports are 10% each, assessed using the following rubric:

Indicator	**Possible points**	**Observations**
The student is **responsible** and careful in handling the laboratory equipment, respects the established laboratory rules and demonstrates solidarity, companionship and respect for peers and professor.	**1**	
The report includes a **header** with the name of the university, name of the student, name of the course, title of the work and a line that separates it from the rest of the work. The sections of the report are: introduction, objectives (general and specific), methodology and materials, results, discussion, conclusions and bibliography.	**1**	
The **introduction** provides a general idea of the report content. It presents a general objective and three specific ones, specified by the professor. The **methodology** describes each activity carried out during the session and the materials used, including a simple list of the scientific names of the specimens studied.	**1**	
The **results** are presented in a table that details: the name of each species studied in the first row, the name of the botanical family of each species in the second row, and the observations made during the session in the third row. Each species is described in a separated table.	**1**	
The **discussion** compares and contrasts the observed results and the information about each specimen found in literature. Possible reasons for finding differences between bibliography and observations are analyzed when necessary. Data regarding uses and conservation status are included; they are discussed according to what was found. **Conclusions** are presented in a **list** and are directly related to the objectives and discussion.	**2**	
The **bibliographical sources** are presented using format APA style last version in the report body and in the references section. A minimum of five bibliographic sources were consulted.	**1**	

One side of one sheet of paper is used for each drawing. **Drawings** are clear, clean and organized. Colors were used to denote the most important structures and morphological characteristics as accurately as possible. Each **drawing** is titled with the scientific name of the specimen. Accurate **arrows** are used to identify each structure in the drawing. Important observations are included as a list at the bottom of each drawing**. Drawings** of structures observed on the **microscope** include the magnification used and the field of view delimited by a circle; each observed structure is labeled with precision.	**2**	
The **report** is clean and organized, and shows good spelling and punctuation, it was delivered on time.	**1**	

Rubric for the analysis of a scientific article: 5%

Criteria	**Possible points**	**Observations**
The **topic** of the article is related to the course, it is relevant and up-to-date, and the source is scientific and reliable. Article **submission** including a generating question was one week prior deadline.	**2**	
The most important parts of the article are **summarized**: authors of the study, objectives of the study, methodology, results and conclusions of the study.	**1**	
The student exposes a **personal point** of view about the analyzed study, using robust foundations that reflect the research on the topic and the understanding of the article.	**1**	
The student performs **moderation** of the participants (gives the word to each person in order, allows expression of points of view, and answers specific questions). A minimum of one **generating question** for the discussion was presented.	**1**	

Rubric for group research and presentation: 10%

Aspects assessed individually	**Possible points**	**Observations**
Dominance on the topic is demonstrated when answering professor and peers' questions, 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 p**ersonal 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	**Possible points**	**Observations**
The presentation **submission** was on time and reliable scientific sources were included in the presentation, according to APA style sixth edition.	**1**	
Each member of the group **participated** presenting sections of the work equally, there was balance in the participation time for each member but the entire group manages the content. The group members **moderated** participants and members take turns to answer questions.	**1**	
All members of the group **dominate** the topic and do not contradict each other in their ideas or content management. There is harmony of knowledge and performance in the group. There is balance between the amount of text	**1**	

and images in the presentation.		

Peers assessment (for group members)	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 members 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**	

Rubric for Individual Presentation: 10%

Presentation aspects assessed by the professor	Possible points	Observations
Topic and sources were delivered **on time**, the presentation was uploaded to Canvas on deadline.	**1**	
Dominance on the topic is demonstrated when answering professor and peers' questions. The student used reliable scientific information to build the presentation and included the sources on the presentation according to APA style sixth edition.	**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.	**1**	
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. The student speaks clearly following a logic sequence, is independent of written material and respects time limits.	**1**	
Peers assessment aspects		
The information presented is in accordance with the standards requested for the assignment; it is complete and interesting, and founded in scientific reliable sources. The student provides robust arguments when answering questions and personal conclusions.	**1**	
The information is expressed fluently and clearly so it is easy to understand. 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**	
Self-assessment aspects		
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 delivered my topic and specifications **on time**, and made the necessary consultations when I had doubts. I was open at all times to receive observations and indications in case of improvement opportunities.	**1**	
I chose the topic and prepared the presentation according to the indications for the assignment. I prepared a robust personal analysis using what learned in class and the information researched for the assignment.	**1**	

Rubric for Verita's garden work

Student: **Date:** **Criteria:**	**A**	**NI**	**NA**
Arrives punctually to the garden and wears appropriate working clothing.			
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: _____

BIBLIOGRAPHY:

Baraona M. & Sancho E. (2007). Frutas Tropicales de Costa Rica - Tropical Fruits of Costa Rica. Distribuidores Zona Tropical

Blancke R. (2016).Tropical Fruits and Other Edible Plants of the World: An Illustrated Guide. Zona Tropical Publications, Cornell University Press, Ithaca and London.

Gargiullo M., Magnuson B., & Kimball L. (2008). A Field Guide to Plants of Costa Rica. Oxford University Press.

Manual de Plantas de Costa Rica:

→ Hammel, B. E.; Grayum, M. H.; Herrera, C.; Zamora, N. (2003). Manual de Plantas de Costa Rica Vol. II: GIMNOSPERMAS Y MONOCOTILEDONEAS (AGAVACEAE-MUSACEAE) (MSB 92). Missouri Botanical Gardens Press

→ Hammel, B. E.; Grayum, M. H.; Herrera, C.; Zamora, N. (2003). Manual de Plantas de Costa Rica Vol. III: MONOCOTILEDONEAS (ORCHIDACEAE-ZINGIBERACEAE) (MSB 93). Missouri Botanical Gardens Press

→ Hammel, B. E.; Grayum, M. H.; Herrera, C.; Zamora, N. (2004). Manual de Plantas de Costa Rica Vol. I: Introduction. Misouri Botanical Gardens Press.

→ Hammel, B. E.; Grayum, M. H.; Herrera, C.; Zamora, N. (2007). Manual de Plantas de Costa Rica Vol. VI: DICOTILEDONEAS (HALORAGACEAE-PHYTOLACCACEAE) (MSB 111). Missouri Botanical Gardens Press

→ Hammel, B. E.; Grayum, M. H.; Herrera, C.; Zamora, N. (2010). Manual de Plantas de Costa Rica Vol. V: DICOTILEDONEAS (CLUSIACEAE-GUNNERACEAE) (MSB 119). Missouri Botanical Gardens Press

→ Hammel, B. E.; Grayum, M. H.; Herrera, C.; Troyo, Silvia; Zamora, N. (2014). Manual de Plantas de Costa Rica Vol. VII: DICOTILEDONEAS, (PICRAMNIACEAE-RUTACEAE) (MSB129). Missouri Botanical Gardens Press.

→ Hammel, B. E.; Grayum, M. H.; Herrera, C.; Troyo, Silvia; Zamora, N. (2015). Manual de plantas de Costa Rica, Vol VIII: DICOTILEDONEAS (SABIACEAE-ZYGOPHYLLACEAE) (MSB 131). Missouri Botanical Gardens Press.

Recommended complementary Bibliography:

Bernhardt E. (2008). Medicinal Plants of Costa Rica. ISBN-13: 978-0970567895

Condit R., Pérez R. & Daguerre N. (2010). Trees of Panama and Costa Rica. Princeton Field Guides, Princeton University Press.

León, J. (2000). *Botánica de los cultivos tropicales.* San José: Agroamérica del IICA.

Montaldo, Á. (1991). *Cultivo de raíces y tubérculos tropicales.* San José: Instituto de Cooperación para la Agricultura.

Raven, P. H., Eichhorn, S. E., & Evert, R. F. (2007). *Biology of Plants* (8th ed.). New York: W.H. Freeman & Company.

Raven, P. H., Eichhorn, S. E., & Evert, R. F. (2007). *Biology of Plants & Laboratory Topics in Botany* (8th ed.). New York: W.H. Freeman & Company.

CHRONOGRAM

Week	Key competence	Content	Evidence of learning
1	Analyzes the importance of plant morphological, reproductive, metabolic and ecosystemic characteristics, as well as plant properties important for botanical applications in diverse academic and economic fields.	**Topic 1. Botany Fundamentals** 1.1 History of the study of plants 1.2 Botany as a science 1.3 Phyto Ecology fundamentals 1.4 Primary and secondary succession 1.5 Interactions: competition, mutualism. parasitism, commensalism.	Course introductions, syllabus and outline reading. Professor's exposition. Brainstorming activity. Group topic analysis.
2		**Topic 2. Plant Morphology** 2.1 Phytomorphology as a science 2.2 Plant systems: The roots system and the shoot system	Professor's exposition. Brainstorming activity. Scientific article analysis
3		**Topic 2. Plant Morphology continuation** 2.3 Morphological adaptations - Morphology lab session **Topic 3. Plant Reproduction** 3.1 Asexual Reproduction 3.2 Sexual reproduction: mitosis and meiosis 3.3 Reproduction cycles in Bryophytes, ferns and allies 3.4 The life cycle of Gymnosperms.	Professor's exposition. Laboratory Practice session #1 Scientific article analysis Video analysis about plant reproduction.

4		**Topic 3. Plant Reproduction continuation** 3.5 Basic structure of the flower, symmetry and types of flowers 3.6 The life cycle of Angiosperms. 3.7 Pollination mechanisms 3.8 Fertilization and germination: fruits and seeds 3.9 Seed dispersal mechanisms - Reproduction lab session	Professor's exposition. Group analysis of the topic. Kahoot activity. Scientific article analysis Video analysis about pollination. Laboratory Practice session #2 Topic summary-revision
5		**Topic 4. Plant Metabolism** 4.1 The plant cell 4.2 Photosynthesis and Cellular Respiration 4.3 Secondary metabolism: plant defenses **Topic 5. Nomenclature and classification** 5.1 Classification and nomenclature 5.2 Bryophytes 5.3 Seedless vascular plants 5.4 Gymnosperms 5.5 Angiosperms 5.6 Gimnospermas 5.7 Angiospermas	Professor's exposition. Brainstorming activity. Scientific article analysis Professor's exposition. Group work: classification poster/mental map Project development revision. Fieldtrip #1
6	Discusses the importance of studies regarding properties of botanical species and their implications on scientific, social, economic and sustainability activities.	**Topic 5. Nomenclature and classification continuation** 5.8 On-site identification 5.9 Ex situ identification 5.10 Specimen Preservation Techniques 5.11 Importance of herbaria	Professor's exposition. Group work: cards or posters elaboration about identification traits and specimens preservation-mounting. Scientific article analysis
7		**Topic 6. Plant Diversity in Costa Rica**	Professor's exposition. Laboratory session #3

		6.1 Plant families represented in Costa Rica 6.2 Usefulness of Costa Rican species and their ecological importance 6.3 Important Neotropical crops	Expert's visit: Orchids Scientific article analysis
8		**Topic 7 . Habitat and adaptations** 7.1 Biomes distribution and classification factors 7.2 Tropical rainforest 7.3 Tropical Dry Forest 7.4 Tropical montane forest 7.5 Tropical Savannas 7.6 Tropical Deserts 7.7 Páramo 7.8 Mangroves	Professor's exposition. Group work: Research a biome in groups of three, according to 5 different aspects: climate, latitude/altitude, fauna and flora adaptations, anthropogenic intervention, representative flora. Present your findings to the class.
9		**Topic 8. Anthropogenic intervention and conservation** 8.1 Entities in charge of conservation and environmental protection in Costa Rica 8.2 Natural and anthropogenic impacts on tropical flora: causes and consequences 8.3 Indigenous populations use of plants **Topics for group presentations:** - Natural and Human Impacts on Flora - Indigenous populations and forest use - Value of tropical forests - Causes of and consequences of tropical forests destruction - Forest fragmentation and conservation - Development and conservation	Professor's exposition. Group presentations Field trip #2 Field trip report #1 delivery Individual presentations

10	Applies basic botanical knowledge to the use of diverse neotropical plants properties, and the promotion of their conservation.	**Topic 6. Plant Diversity in Costa Rica continuation** 6.1 Plant families represented in Costa Rica 6.2 Usefulness of Costa Rican species and their ecological importance 6.3 Important Neotropical crops	Professor's exposition. Lab session #4 Project improvement revision. Laboratory session #3 report delivery Individual presentations
11		**Topic 8. Anthropogenic intervention and conservation (continuation)** **Topics for group presentations:** - Natural and Human Impacts on Flora - Indigenous populations and forest use - Value of tropical forests - Causes of and consequences of tropical forests destruction - Forest fragmentation and conservation - Development and conservation	Professor's exposition. Topics summary Experts exhibition: Analog Forestry Fieldtrip #2 report delivery Individual presentations
12		All topics integration into assignments.	Lab #4 report delivery Final project exhibition

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/