Center For International Programs and Sustainability Studies
Course Name: Tropical Botany: Useful Plants Workshop
Course Code: ENV 3150
Total Contact Hours: 60
Pre-requisites: It is recommended, but not required, that students complete a basic biology course prior to entering this course.

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

COURSE DESCRIPTION

This course will provide students with a general overview of Neotropical useful plants. Students will gain insight about **basic botanical concepts** well as the **most important uses of plants in the Neotropics**. The skills, competences and values developed during the course will provide students with important tools to work in scientific research, conservation, and sustainability fields.

The course includes **laboratory practices** to develop specific ex-situ research and analysis competences. **Field trips** provide an important experience with different Neotropical ecosystems and the Flora diversity of Costa Rica, where plant adaptations and ecosystemic interactions are easily observed. For these reasons, field trips allow students to develop in-situ research, observation, ad analysis competences. 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 expert visits.

The topics covered are deep regarding theory and experience. The course demands extra class reading and preparation of assignments, outside activities, and research.

CLOTHING AND FOOTWEAR REQUIREMENTS

It is necessary for foreign students to bring clothes for warm and for 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.

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.

This is a theoretical-practical course, and it seeks to clarify the following question:
What are the most important botanical characteristics of tropical plants in Costa Rica, their traditional and new trends for their use?

To answer this question, the following **generative topics** will be studied:

- 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

Throughout the course the following **skills** will be promoted:

- 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.

Among the **values and attitudes** that will be promoted 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

COMPETENCE, CRITERIA AND EVIDENCE

The competencies for Veritas University are reflexive and integrated actions that respond to the professional profile and to the problems of the context, with suitability and ethical

commitment, integrating the know-how, the know-how, and the knowledge to know in a perspective of improvement.

Below are both the disciplinary and general competencies, linked to their criteria and evidence of performance for this course.

Competences	**Key competences**	**Evidence of learning**
Disciplinary Analyzes important morphological and ecological characteristics of Neotropical plants to promote their proper use and conservation, in accordance with the Botany science field.	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.	Laboratory Practice Reports Project presentation Scientific article analysis Field Trip Reports Individual presentations. Plant file
	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. Plant file
	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
Core/Generic		
Integrates knowledge, skills and attitudes to continuously learn 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
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

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

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 root 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 Savannahs

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:

- 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

METHODOLOGY

The methodology is planned as experiential learning using Paolo Freire's educational guidelines, from a constructivist perspective and, the competency-based model.

Classes are of an interactive nature, stimulating the collective construction of knowledge; so, the students can recognize, by their own means, the context in which they are and how they can use it to understand the topics of the course for use in their future careers.

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 included.

Since research is a pillar of the subject, the topics to be discussed and presented in class and in 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.

The student learns to deepen the importance of Botany by analyzing theory and history of this discipline and the current applications of the discipline. 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 the country, 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 and knowledge construction.

The project method is essential to the course, in which students apply and build learning through the realization of design projects, which imply to plan, execute, and evaluate a series of activities with the aim of solving a problem and reaching clear objectives. It seeks to confront students to situations that lead to rescue, understand, and apply what is learned in class and field trips to solve health, environmental, and social problems.

Field trips promote direct and participatory learning, reflected in field trip reports. Information and Communication Technologies represent tools for continuous use in the course.

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. It also fosters social integration, the development of group work skills, community feeling and respect, without neglecting individualization.

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. 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

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, and the details will be provided in **CANVAS LMS**. 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.

ASSIGNMENTS*	PERCENTAGE VALUE
Individual presentation	**10%**
Group research and presentation	**10%**
Article presentation and discussion	**10%**
Field trip reports	**20%**
Laboratory reports	**20%**
Botanical sample and useful product Project	**30%**
Total	**100%**

* 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 from the first-class day.

LEARNING STRATEGIES

For all assignments punctuality and good organization will be evaluated.

The following learning strategies will be carried out:

1. **Analysis of a botanical scientific article** provides an updated perspective of scientific and technological progress and applications and encourages group participation and discussion. Each student searches, chooses, reads, and analyzes a **botanical scientific article**, deepens the search if necessary, and **orally** presents it to the class.

The topic is free but must be closely related to the course content, the professor will provide an on-line folder with several articles as options for students but choosing from that folder is not mandatory. One article analysis per student is required, the presentation is 10% 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 research and presentation** 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 researching a given topic from Unit 8 called **"Anthropogenic intervention and conservation"**, and presenting it using PPT, Prezi, or other useful tool, **no report is required**. 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 recommended.** Members of the class not presenting ask questions to the presenters about the topic. Presenting time plus questions and discussion will be **20 minutes maximum**, depending on the amount of students enrolled; the assignment is 10% of total grade. **The topic must be sent to professor for approval at least 1 week before presenting, presentation must be uploaded to Canvas the day before presenting.** Rubrics:

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.

The content of the presentation is guided by the different topics of the course, 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 presentation day**. 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 number of students enrolled. **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 an **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 number 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 paragraph 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 (15%):** 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 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 reports, which represent **20% of total grade.**

There are two mandatory field trips in this course, which are not excursions or 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 mealtimes. 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 punctual** for all field trip related activities including departure, return and scheduled mealtimes. 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. Notes help students write the field trip report.

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, they **don't require a report** but they are considered part of the formative process and evaluation of the course, they are meant to prepare students for the last two ones, help them acquire expertise in drawing, labeling, recognizing, and describing fresh samples. Phytomorphology and plant reproduction knowledge gained in these

sessions is applied to the identification of the unique characteristics of each species in the last two sessions.

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.

Drawings of the two last lab practices must be delivered to the professor, together with the written lab report uploaded to Canvas) following scientific articles/reports structure and format and APA style for references.

The reports represent 20% **of the total grade**. **Examples for reports structure and more details are provided on Canvas.**

Important instructions for students regarding the different sections of laboratory reports are:

- **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 logical way. Use a scientific article from a recognized Journal as a reference if you are not sure about the structure of the introduction.

- **Objectives**: Lab objectives will be provided by the professor during the lab, include them in your report (copy and paste).

- **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.)
- 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.

- **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.).

- **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.

6.1 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.

6.2 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.

6.3 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.

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 on specific topics visits and lectures, and laboratory activities when possible.

ATTENDANCE

Regarding classes:

1. Students are only allowed a total of two (2) nonconsecutive (back-to-back) **class absences**. A student shall fail the course if more than two absences are registered.

2. Three **late arrivals to class** (within the first 15 minutes) are treated as one absence. Attending class 30 minutes late without an official justification will count as an absence.

3. In the case of an **absence from any assignment evaluated in class** (presentations, evaluations, field trips, etc.) a student will be given a grade zero unless an official document is presented within one week of the absence.

4. On presentation of the official justification to excuse the absence, the missed assignment shall be presented on that same day in order to avoid a grade zero.

Regarding field trips:

5. An unjustified **absence on a field trip** will immediately result in the loss of all points assigned to that specific trip. However, if an official document justifying the absence is presented, 50% of the assignment points may be obtained on presentation of a complementary research assignment, to be agreed upon with the professor, within one week of the field trip.

6. An absence on a field trip may be justified should two course field trips coincide. In such a case, and in order to avoid losing points, students shall be able to opt for carrying out a research assignment.

CODE OF CONDUCT

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

1. Be disruptive in the classroom
2. Behave in a disrespectful way
3. Be under the influence of alcohol or even smells of alcohol
4. Be under the influence of any illegal drug
5. Show hygiene-related problems that may disturb other students

ELECTRONIC DEVICES

The use of cell phones, smartphones, or other mobile communication devices is disruptive and is therefore prohibited during class. Students will be requested to turn all devices OFF and put them away when class begins. These may be used only when the professor assigns a specific activity including Internet-related searches and other processes. Those who fail to comply with this requirement will be asked to leave the classroom for the remainder of the class period.

PROGRAM POLICIES

The student must comply with the provisions of Universidad Veritas CIPSS Student Policies available on the Canvas platform.

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 llustrated Guide. Zona Tropical Publications, Cornell University PresS..

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. Agroamérica del IICA.

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

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

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

CHRONOGRAM

This chronogram can change according to the course needs.

Week	ContentS	Learning strategies
1	**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 lecture. 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 lecture. 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 lecture. 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 lecture. 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 lectures. Brainstorming activity. Scientific article analysis Group work: classification poster/mental map Project development revision. Fieldtrip #1
6	**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 lecture. Group work: cards or posters elaboration about identification traits and specimens' preservation-mounting. Scientific article analysis

7	**Topic 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	Professor's lecture. Laboratory session #3 Expert's visit: Orchids or Fungi (to be defined) 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 lecture. 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 lecture. Group presentations Field trip #2 Field trip report #1 delivery Individual presentations
10	**Topic 6. Plant Diversity in Costa Rica**	Professor's lecture.

	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	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 lecture. Topics summary Experts exhibition: Analog Forestry Fieldtrip #2 report delivery Individual presentations
12	All topics integration into assignments.	Lab #4 report delivery Final project presentation