CENTER FOR INTERNATIONAL PROGRAMS & SUSTAINABILITY STUDIES
Course name: Tropical Ecology
Course code: ENV 3044
Total Contact Hours: 60

Course description

This course will provide students with a general overview of tropical ecology. Students will gain insight into basic ecological concepts and be able to explore a variety of ecosystems, their animals and the multiple and complex ecological interactions that can be found in these areas. 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 study of the ecosystems found in Costa Rica, but others will be discussed as well.

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

How has Tropical Ecology been applied to understand the adaptations, coexistence and interaction among biodiversity in tropical ecosystem?

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

- Tropical ecology as a science
- Ecosystem components
- Plants and animal ecological interactions
- Plant and animal identification
- Physical conditions of terrestrial and marine ecosystems
- Trophic levels and its components
- Tropical terrestrial and marine ecosystems
- Marine ecology
- Human impact in tropical ecosystems

The course will promote the following skills:

- Ability to understand the concepts of tropical ecology as a science.
- Ability to debate about the significance of the biodiversity in the tropics.
- Ability to identify the complex ecological interactions.
- Ability to encourage the knowledge of ecology with the integration of other biological science.
- Ability to identify human impacts that threaten the biodiversity in the tropics.

Among the **values** and **attitudes** that will be promoted among the students are the following:

- Excellence in performance evidence.
- Responsibility to achieve goals.
- Tolerance to work in group.
- Respect to nature and their ecosystem (organism, stakeholder, and local community)
- Negotiating knowing how to inspire trust and empathy

Competencies, criteria and evidence

The competencies for the Veritas University are reflective and integral actions that respond to the professional profile and to the problems of the context, with appropriateness and ethical commitment, integrating the knowledge of being, know-how and knowledge to know in an improvement perspective. Below are both the disciplinary and general competencies, linked to their criteria and evidence of performance for this course.

Types of competencies	Performance criteria (sub-competencies)	Performance evidences
Specific Analyzes the importance of ecological characteristics and its biotic and abiotic components in the tropic ecosystems to understand the adaptations, coexistence and complex ecological interaction, in accordance with the Ecology as a science.	1_Discuss the concept of tropical ecology as a science considering its biotic and abiotic components.	Oral presentations Essay Mind Maps
	2_Analyse the importance of ecological studies regarding to the adaptations, coexistence, and interactions.	Oral presentations Essay
	3_ Applies basic ecological knowledge to use for the identification of different ecosystem and its biodiversity.	Thematic discussion Video field trip report
	4_ Analyze terrestrial ecosystem using standardized surveys and community analysis with diversity indexes	Laboratory practices Essay Final research presentation
Generals		
Integrates concepts, nomenclature and key elements from the course to be used in upcoming professional life.	Learning to learn.	Thematic discussion / Mind Maps
Develops the knowledge, skills and attitudes necessary to learn how to communicate orally and in writing in the different areas.	Communicate disciplinary thoughts in an oral and written manner.	Essay/ Oral presentations / Final research report
Integrates the knowledge, skills and attitudes necessary to learn the techniques of teamwork and leadership.	Teamwork and leadership.	Oral presentations / Final research report
Integrates the knowledge, skills and attitudes necessary to learn the interpersonal communication techniques.	Respect towards other handle and resolve conflicts. To negotiate knowing how to inspire trust and empathy. Critical and logical thinking	Thematic discussion / Final research report

Contents

Subject 1. Tropical Ecology: Basic concepts
- Ecology as a science
- Biodiversity and its environment
- Biotic and abiotic elements
- Organization of the biotic components
- Population, communities and ecological interactions
- Biotic and abiotic elements
- Trophic levels, food chains, and food webs

Subject 2. Tropical terrestrial ecology
- Physical conditions
- Biogeography of the central American Isthmus
- Geography and climate of Costa Rica
- Tropical biodiversity
- Life zones
- Plant and animal ecology

Subject 3. Tropical terrestrial ecosystems
- Rain forests
- Montane forests
- Subalpine Paramo
- Dry forests
- Savannas
- Deserts

Subject 4. Tropical wetlands and marine ecology
- Tropical terrestrial and marine wetlands
- Energy transfers in aquatic environments
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- Tropical marine ecosystems
- Human impacts

Subject 5. Diversity analysis

-Alfa and Beta Diversity indexes

-Multivariate community analysis

Methodology

This course promotes the interaction between the students and the teacher, in order to develop an active feedback between the two parties. The course will be composed of participatory activities through case studies where the objective is that the students can solve in an individual and group way a research question previously planned by the teacher. This in turn would allow students to learn and critical analysis in different working situations.

Learning Strategies

The following learning strategies will be carried out:

- Oral presentation: By means of digital presentations (power-point) each group of students will explain the content pertaining to a research topic assigned in advance by the teacher. The students must present at the end of this

presentation the bibliographic sources in APA format, Sixth Edition, with a minimum of 10 references and their respective connection link.

- Thematic discussions: the end of this activity is for students to make small progress on their current research project (successes and misrepresentations) in front of the rest of the class and discuss possible suggestions for improving their models.

- Mind maps: It will take advantage of the development of mental maps (systems mapping) through which students will be able to investigate, extract, summarize and expose the most important information regarding their research topic.

- Laboratory practices: Laboratory practices will be established and implemented where the student conducts several processes throughout the course: DNA extraction, PCR, and Electrophoresis chamber. In order for the student to develop skills related to the correct proceeding in a molecular biology laboratory (BIOMOL).

- Essay: Students, individually, may issue their own opinion by formally interpreting and evaluating a specific topic. The objective is that the student correlates his research and his own knowledge and can clearly argue a possible application in real life.

- Video Field trip report: The field trip will be assessed by means of a video report where audiovisual material (photographs and/or video) will be included, where each of the activities performed in the field trip.

- Final research presentation: At this point students will conduct a thorough investigation into the topic assigned at the beginning of the course. They will have to carry out the analysis of their own results, consult literature and if possible consult experts on their research topic. At the end of the course students will present the information collected and analyzed in scientific article format to the professor. At the same time students should prepare a summary for the rest of their classmates, as they will be reviewers of the students who would present their findings on the final filing date.

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.

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.

Rubrics	Weight
Oral presentations: ● Two oral presentations	**20%**
Video field trip report: ● One video field trip reports (North Pacific area)	**20%**
Field practices ● Three laboratory practices (ecological adaptations, sampling biodiversity, data analysis)	**15%**
Essay: ● Three essay need to be achieved in the following topics: ecological adaptations, sampling biodiversity, and human impacts in the tropics.	**15%**

Final research presentation: ● Topic assigned at the beginning of the course (includes summary and oral presentation)	**30%**
TOTAL:	**100%**

Rubric to evaluate oral presentations

From digital presentations, from previously assigned topics, it is intended that students through teamwork formulate critical and logical ideas that can then be transmitted orally and encourage the rest of the audience (classmates) to issue different points of view.

For the purposes of this course, two oral presentations with a value of 10% for each one will be made, with a total value of 20%. These presentations will be assessed by the following heading:

Indicator	**3**	**2**	**1**	**Observations**
Contents to be assessed in the oral presentation				
There is a mastery of concepts and these are transmitted effectively.				
It uses clear and representative images of the concept that is intended to manifest.				
The student has good projection and posture when it comes to exposing his subject. It doesn't get hard to get to the wall and it doesn't put its hands inside the pockets.				
The student expresses ideas related to the images in a fluent and clear way, without having to read support material (tokens, notes or text of the slides).				
The presentation has a logical order that allows the understanding of the subject exposed to the class.				
The student clearly and critically issues his own opinions on the assigned topic.				
The conclusion is solid and leaves the viewer with an absolutely clear idea of the issue exposed by the issuer.				
The student responds satisfactorily to the questions of the teacher and classmates regarding the subject exposed.				
The sources of information are varied and multiple (minimum 10 bibliographical sources) and contribute to the development of the topic. The information collected is related to the topic, is relevant and updated.				
Formatting aspects for oral presentation				

Includes cover with basic information (name of the students, name of the university and title of the subject).				
The bibliographical sources are in APA format (in its last edition) at the end of the presentation.				
It presents order, good spelling and punctuation.				
Total:				

Rubric to evaluate the video field trip report

The idea in this case is that students have the opportunity to interact and observe some marine species, the medium in which these species are found and in turn their interaction with the local community in “El Jobo”. Therefore, all the information and experience acquire during the fieldtrip will be translated into an audio-visual material (videos) where they will describe each of the activities performed, which they have learned, results, discussions, and their opinions.

One field trips represent the total value of 20% and evaluated by the following heading:

Indicator	**3**	**2**	**1**	**Observations**
Report content				
The report has a logical sense as the different activities in the field trip are presented.				
The introduction has information obtained from books and/or scientific journals that supports the information within this report.				
The methodologies applied in each field tour activity (previously explained by the professor) are detailed in the report in written form.				
The methodology is supported by means of audiovisual and/or photographic material obtained specifically during the field trip.				
Relevant observations and conclusions are included around the activities performed on the field trip.				
Format aspects				
The report includes cover with the basic data (name of the students, name of the university, title, dates, location of the tour, etc.).				
Organization of the report: the structure of the work includes introduction, description of activities, audiovisual material obtained (photographs and/or edited videos), bibliography and/or annexes.				
The bibliographical sources are in APA format in latest edition.				
Presents order, has good spelling and punctuation.				
It presents space between lines (1.15) and source (Arial_11) according to the format requested by the teacher.				

Total:				

Rubric to evaluate laboratory practices

Laboratory practices are learning and analysis activities in which the scientific method is applied. Each practice will have a specific objectives and methodology to follow, previously established. Three topics will be analyzed: one session for ecological adaptations in the tropics, one session for sampling biodiversity, and one session for marine biodiversity of north Pacific area of Costa Rica. Each laboratory session will be assessed with a value of 5% based on the information acquires and evaluated on drawing, labeling, recognizing, and describing samples exhibited. Drawings from the three lab practices must be delivered to the professor, together with the written lab report (by email) following scientific articles/reports structure, format, and APA style for references.

Instructions for the students regarding to the different sections of this reports are the following:

1. **Introduction**: this section provides the reader the general knowledge of the topic related to each laboratory practice, which include a summary of each section written in an understandable and logic way. Use scientific articles from recognized journal as a reference. It must be one page (1.5 spaced).
2. **Objectives**: lab objectives will be provided by the professor during the lab, include them in your reports. 1 general and 2-3 specific objectives. It must be 1 general and 2-3 specific objectives.
3. **Methodology**: this section describes how the activity in the lab was performed, detailing the materials used in the lab (for example: stereoscope, petri dishes, samples, etc.), include a list of specimens (use common and scientific names) presented in the lab.
4. **Results**: this section includes the drawings and observations (labeled structures, special personal observations, etc.). Choose 3 specimens studied during the lab. For each species the students group chose, research and provide a general ecological description of the family and the specimens, make sure to research on reliable internet sources, books, scientific journal, etc.).
5. **Discussion and conclusions**: this section is most important for the report. It means to compare and contrast the observations against the information provide in the literature, providing differences and similarities between the observations and the information researched about the specimens/genera/families. It is expected to read after class about the families and species observed in order to be able to provide logic conclusions about the morphology, distribution, and ecological facts, among others. The discussion must be written in prose and conclusion as a list. References use a APA style. Make sure to use only reliable scientific sources.

The three (3) group laboratory practices have a total value of 15%, in the end will average the score obtained between all practices and then that will be the equivalent of 15%, for this will be used the following headings:

Indicator	**3**	**2**	**1**	**Observations**
The students are responsible and careful in the manipulation of the laboratory equipment, respect the established laboratory rules and show solidarity, fellowship and respect for other classmates and teachers.				
The report includes a heading with the name of the students and the following sections of the report are complete: introduction, objectives, methodology and materials, results, discussion and conclusions and bibliography (the latter as requested by the professor).				
The introduction provides a general idea of the contents of the report. Presents a general and minimum objective a specific. The methodology				

describes each activity performed during the session and the materials used.				
The results should be presented in prose or in a table. In both cases, the name of the species studied and the observations made during the session must be detailed.				
The discussion compares, contrasts and discusses the observed results and the information found in the literature.				
The conclusions are presented in a list and are directly related to the objectives and the discussion.				
The report is clean and organized, and shows good spelling and punctuation.				
Total:				

Indicator	**3**	**2**	**1**	**Observations**
The students are responsible and careful in the manipulation of the laboratory equipment, respect the established laboratory rules and show solidarity, fellowship and respect for other classmates and teachers.				
The report includes a heading with the name of the students and the following sections of the report are complete: introduction, objectives, methodology and materials, results, discussion and conclusions and bibliography (the latter as requested by the professor).				
The introduction provides a general idea of the contents of the report. Presents a general and minimum objective a specific. The methodology describes each activity performed during the session and the materials used.				
A section is shown where the students explain, in prose, the observations made during the session. This section should include a description of the progress of the student group in that session.				
Students must create a folder in the computers with the necessary software for the session of the day, they must also make a "Screenshot" on the work corresponding to that day where the date and time of the class appear in the laboratory.				
The report is clean and organized, and shows good spelling and punctuation.				
Total:				

Rubric to evaluate an argumentative essay

Students, individually, may issue their own opinion by formally interpreting and evaluating a specific topic. The

objective is that the student correlates his research and his own knowledge, and can clearly argue a possible application in real life. The essay is strictly individual and student authorship. Three topic will be analyzed: ecological adaptation, sampling biodiversity, and human impacts in the tropics.

For the purpose of this course, thee argumentative essay will be evaluated with a value of 5% for each one, and with a total value of 15%, and they will be evaluated by the following heading:

Indicator	**3**	**2**	**1**	**Observations**
Introduction: Includes purpose, general theme exhibition and clear objectives.				
The main idea names the essay theme and outlines the main points to be discussed.				
Coherent, serious and convincing personal contributions are presented on the subject of the essay. At least two original and applicable contributions to the subject are presented.				
The secondary arguments and ideas are presented in a logical order that makes the author's ideas easy and interesting to follow.				
The structure or the order of the words (syntax) in the sentences is logical. Use punctuation and pronouns correctly. Carefully select the words (does not use slang).				
All the ideas presented are related to the topic. Ideas are presented with clarity and objectivity. These are not repeated nor do they show gaps. It did not use copying and pasting.				
The conclusion is solid and leaves the reader with an absolutely clear idea of the author's position.				
It has no spelling errors, accentuation or verb conjugation.				
Meets the following requirements: cover, margin size, intelligible font, character size, paragraph spacing, title congruent with content, student and subject information, appointments are clear and accurate.				
The sources of information are varied and multiple (minimum 10 bibliographical sources) and contribute to the development of the topic. The information collected is related to the topic, is relevant and updated.				
Total:				

Rubric to evaluate the final research presentation

This work aims to confront the student to a scientific investigation, which implies introducing and familiarizing each person with the different activities that are carried out in an investigation in the real life. Constructive critique and

cooperativism are also promoted. The research carried out by the student groups will be developed in phases throughout the course. By means of conservation biology applications and tools and their respective procedures, complemented with cases of studies and their subsequent interpretation of their results. All of this findings will be presented and explained to the rest of the class through a group oral presentation.

This group final research presentation has a total value of 40%, has three qualification rubrics which have a different evaluation percentage: **1)** the first rubric has a scale of 1 to 5 and has a percentage of 25% where the work will be assessed formal writing; **2)** the second part, with a scale of 1 to 3 with a percentage of 5%, the format of the written work will be assessed and an auto-qualification will be carried out with respect to performance throughout the research project; **3)** a third heading with a scale of 1 to 3 will evaluate an oral presentation related to the research project. Each one will be evaluated according to the indicator in each table in the following way:

Indicator	**5**	**4**	**3**	**2**	**1**	**Observations**
Project structure and content						
The project is presented by a document written in the scientific article format.						
It includes the summary (*abstract*) of all the parts of the research summarized, as established in a scientific article (development, results, discussion and conclusion/recommendations).						
The work contains an introduction (minimum 3-4 slides), methodology (between 2 and 3 slides). Contains results (minimum 2 slides), Discussion (minimum 3 slides), conclusions and recommendations (minimum 2 slides).						
The introduction is clear and coherent it has logical order, which truthfully explains the contents of the investigation. It has bibliographic citations.						
The methodology explains step by step, in logical order, the procedures that were carried out throughout the investigation. It has bibliographic citations within the text in APA format in its last edition.						
Relevant results are presented for the investigation. Includes discussion, conclusions and bibliographic citations in the text.						
In the discussion there is a logical comparison of the results obtained and the information found in literature. It manages to analyze and explain possible differences between the consulted bibliography and the results obtained, when necessary.						
The sources of information are varied and multiple (minimum 10 bibliographic sources) that contribute						

to the development of the topic. The information collected is related to the topic, is relevant and updated.						
Total:						

Indicator	**3**	**2**	**1**	**Observations**
Project Format				
It has the space between lines (1.5) and the font (Arial_11) according to the format requested by the teacher.				
The project includes cover with the basic data and an executive summary (digital) for classmates and teachers.				
The results section presents pictures, figures, or other resources to represent them consistently.				
The bibliographical sources are in APA format in their latest edition.				
It presents order, good spelling and punctuation.				
Self-assessment				
I was responsible for the advances (oral and/or written) requested by the teacher, as I developed my research project.				
I devoted the time and effort necessary since the beginning of the course for research development.				
I did a thorough search of scientific information to give real support to my research.				
In my laboratory work, from ecological adaptation, sampling biodiversity, and human impacts in the tropics were elaborated with great care and passion.				
I really followed the indications and advice of my teacher in the different phases of my final research.				
Total:				

Indicator	**3**	**2**	**1**	**Observations**
Contents to be assessed in the oral presentation				

There is a mastery of concepts and these are transmitted effectively.				
It uses clear and representative images of the concept that is intended to manifest.				
The student has good projection and posture when it comes to exposing his subject. It doesn't get hard to get to the wall and it doesn't put its hands inside the pockets.				
The student expresses ideas related to the images in a fluent and clear way, without having to read support material (tokens, notes or text of the slides).				
The presentation has a logical order that allows the understanding of the subject exposed to the class.				
The student clearly and critically issues his own opinions on the assigned topic.				
The conclusion is solid and leaves the viewer with an absolutely clear idea of the issue exposed by the issuer.				
The student responds satisfactorily to the questions of the teacher and classmates regarding the subject exposed.				
The sources of information are varied and multiple (minimum 10 bibliographical sources) and contribute to the development of the topic. The information collected is related to the topic, is relevant and updated.				
Formatting aspects for oral presentation				
Includes cover with basic information (name of the students, name of the university and title of the subject).				
The bibliographical sources are in APA format (in its last edition) at the end of the presentation.				
It presents order, good spelling and punctuation.				
Total:				

Bibliography:

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Nibakken, J.W. & M.D. Bertness. 2005. Marine Biology: An Ecological Approach. 6th ed. Benjamin Cummings, San Francisco, 579p.

Janzen, H.D. 1983. Costa Rican Natural History. The University of Chicago Press. 789p.

Kricher, J. 1997. A Neotropical Companion: An Introduction to the Animals. Plants, and Ecosystems of the New World Tropics. 2nd ed. Princeton University Press, Princeton, NJ.

Stiles, G.F. & Skutch A. 2007. Guía de aves de Costa Rica. 4ta. edición Trad. L.

Roselli, illus. D. Garner. Instituto Nacional de Biodiversidad, Heredia, Costa Rica. 576 pp.

Savage, Jay M. 2002. The Amphibians and Reptiles of Costa Rica. The University of Chicago Press.

Reid, F. A Field Guide to the Mammals of Central America and Southeast Mexico.

Schedule

Week	Sub-competencies	Contents	Teaching strategies

1	Discuss the concept of tropical ecology as a science considering its biotic and abiotic components.	**Subject 1. Tropical Ecology: Basic concepts** -Ecology as a science -Biodiversity and its environment	Thematic discussion
2		**Subject 1. Tropical Ecology: Basic concepts** -Biotic and abiotic elements -Organization of the biotic components	Oral presentation #1
3		**Subject 1. Tropical Ecology: Basic concepts** -Population, communities and ecological interactions	Essay Thematic discussion
4		**Subject 1. Tropical Ecology: Basic concepts** -Biotic and abiotic elements -Trophic levels, food chains, and food webs	Essay Thematic discussion
5	Analyze the importance of ecological studies regarding to the adaptations, coexistence, and interactions.	**Subject 2. Tropical terrestrial ecology** -Physical conditions	Essay Thematic discussion
6		**Subject 2. Tropical terrestrial ecology** -Biogeography of the central American Isthmus -Geography and climate of Costa Rica	Oral presentation #1
7		**Subject 2. Tropical terrestrial ecology** -Tropical biodiversity -Life zones	Essay Thematic discussion
8		**Subject 2. Tropical terrestrial ecology** -Plant and animal ecology	Thematic discussion
9	Applies basic ecological knowledge to use for the identification of different ecosystem and its biodiversity.	**Subject 3. Tropical terrestrial ecosystems** -Rain forests	Mind maps Thematic discussion
10		**Subject 3. Tropical terrestrial ecosystems** -Montane forests -Paramo	Thematic discussion
11		**Subject 3. Tropical terrestrial ecosystems** -Dry forests	Mind maps Thematic discussion
12		**Subject 3. Tropical terrestrial ecosystems**	Thematic discussion

		-Savannas -Deserts	
13	Analyze marine ecosystem considering the life zones, energy transfers, and its productivity.	**Subject 4. Tropical marine ecology** -Marine ecology as a science -Ocean life zones -Energy transfers in marine environments	Thematic discussion Lab practices
14	Understand the diversity community analysis	**Subject 5. Diversity analysis** - Alfa and Beta diversity indexesindexes -	Thematic discussion Lab practices
15		**Subject5. Multivariate community analysis** - Canonical Correspondence Analysis - Occupancy modeling	Lab practices

General observations

The student must comply with the provisions of the Veritas University student regimen regulation. To consult it you should go to the student self-management Portal at the following address: http://autogestion.veritas.cr/ and download it.