Environmental Engineering in the Tropics (energy, climate and water footprints traced through bananas, coffee and rice)

Costa Rica -Winter Break 2012

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Role of the Syllabus
The syllabus represents a semi-formal agreement between the instructors and the student. As such, both the student and the instructor are responsible for following the policies detailed within this document unless otherwise noted in class and submitted in writing.

If you feel that the instructors have not followed the guidelines outlined in this document, please consult with them as soon as possible about your concerns. If your concerns are not addressed, you should contact Dr. Ajit Srivastava, Department Chair, Biosystems and Agricultural Engineering, or the MSU Ombudsman.

Program Instructors

<table>
<thead>
<tr>
<th>Instructors</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Luke Reese</td>
<td>517.353.3258</td>
<td><a href="mailto:reesel@msu.edu">reesel@msu.edu</a></td>
</tr>
<tr>
<td>Biosystems &amp; Agricultural Engineering 103C Farrall Hall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr. Dawn Reinhold</td>
<td>517.432.7732</td>
<td><a href="mailto:reinho17@msu.edu">reinho17@msu.edu</a></td>
</tr>
<tr>
<td>Biosystems &amp; Agricultural Engineering 205 Farrall Hall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ing. Jose Francisco Aguilar</td>
<td>506.2511-6643</td>
<td><a href="mailto:jose.aguilar@ucr.ac.cr">jose.aguilar@ucr.ac.cr</a></td>
</tr>
<tr>
<td>Director Biosystems Engineering Department Universidad de Costa Rica</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Werner Rodriguez Montero, Ph.D.</td>
<td>506.2511.7798</td>
<td><a href="mailto:werner.rodriguez@ucr.ac.cr">werner.rodriguez@ucr.ac.cr</a></td>
</tr>
<tr>
<td>Director Fabio Baudrit Experiment Station Universidad of Coast Rica</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *Email is the official means of communication at MSU.* Instructors will communicate with you before and after the program using email and the ANGEL system. You are responsible for following this correspondence and ensuring that you meet deadlines as they arise.

Program Description
This two-week winter-break study program explores the design and performance of clean energy and water systems in the tropics joined by peer faculty and students from the Universidad de Costa Rica Ingenieria Agricola. Participants will explore broad questions related to sustainable biomass energy production, ecosystem services and clean water. Ecological carbon, water and energy footprints for bananas, rice and coffee will be used to categorize and evaluate system designs in the context of sustainable economics, environment and social systems. Students will connect these topics back into their lives as students, future engineers, scholars, and global citizens by researching and answering questions such as:

1. Is biomass energy production sustainable and viable in a topical environment where biomass is abundant? What engineering principles and designs can be used to improve energy production while maintaining a carbon-neutral and clean water footprint?
2. What are the biomass, energy and water footprints for commodities grown primarily outside of the US for consumption in the US (e.g., bananas, rice and coffee)? Students will individually select 2 of the 3 crops to complete a complete assay of the biomass, energy and water lifecycles of their selected crops from production to post-consumption. Students will individually create an engineering design or evaluation for one of their selected crops to reduce the crop’s energy or water footprints. How could engineering designs or evaluations be used to reduce energy and water footprints for these commodities?
3. How does an engineer consider the social, cultural and environmental impacts of an international engineering design where language could be a barrier, materials might be limited and variables are different than in the US?
4. What are our personal and collective responsibilities toward being global citizens and engineers?

Program participants will visit cities, villages, Universities, University research facilities, industries (e.g., ICE, ICafe, etc.), non-profits/university facilities (e.g., INBio, OTS, CATIE, EARTH, etc.), museums, national parks, agribusinesses, and forests, as well as selected cultural and historical sites, as a means of considering these questions. Students also will be exposed to situations that help foster their growth as global citizens and
professionals where hands-on labs/activities will be conducted in active-learning format to understand design, performance, installation and system evaluation.

**Program Goals**
This program has several goals that form the basis for the program’s structure, itinerary, and assessment methods. Students should keep these goals in mind when completing their assignments.

This program seeks to help students:

1. Understand major themes related to clean energy, water and climate and the interactions among these systems in Costa Rica as compared to the U.S.;
2. Develop their critical, creative, design and reflective thinking skills related to clean energy, climate, water and ecosystem services;
3. Enhance their ability to interact with cultural differences, understand issues of socio-economic equity, and consider issues from diverse perspectives for engineering designs and installations;
4. Challenge, understand, and appreciate their culture and experiences and how these areas influence their world views; and
5. Understand the meaning of citizenship as it relates to one’s personal and professional influence on local, national, and global issues.

**Program Objectives and Learning Outcomes**
1. Students will use ecosystems engineering to analyze sustainability of anthropogenic systems to produce water, energy, and food. The ECPA demonstration site and National Electric Company (ICE) production sites will be used for academic activities.
2. Students will design and select components of the ECPA bioenergy and ecosystem systems and will participate in select installations. Designs will incorporate international context, material limitations, units and language; and will incorporate ecosystem services.
3. Students will trace and account for the biomass, water, and energy footprints/lifecycles from production to post-consumption for two of three crops (rice, bananas or coffee) produced in Costa Rica, used in Costa Rica and/or exported to the US.
4. Students will research, analyze and recommend engineering practices which would reduce the carbon, water and energy footprints/lifecycles of these commodities.

**Connection to MSU Liberal Learning and Global Competency Goals**
The program hopes to help students achieve many of the goals related to MSU’s institutional learning outcomes.

1. **Analytical Thinking** - (a) Understands the complexity and interconnectedness of global processes and is able to critically analyze them, as well as compare and contrast them across different cultures and contexts
2. **Cultural Competency** – (a) Understands the influence of history, geography, religion, gender, race, ethnicity, and other factors on their identities and the identities of others; (b) Recognizes the commonalities and differences that exist among people and cultures and how these factors influence their relationships with others; (c) Questions explicit and implicit forms of power, privilege, inequality, and inequity; (d) Engages with and is open to people, ideas, and activities from other cultures as a means of personal and professional development
3. **Civic Engagement** – (a) Understands the connection between their personal behavior and its impact on global systems; (b) Uses their knowledge, attitudes, and skills to engage with issues that address challenges facing humanity locally and globally
4. **Effective Communication** – (a) Uses observation, conflict management, dialogue, and active listening as means of understanding and engaging with different people and perspectives; (b) Communicates their ideas and values clearly and effectively in multiple contexts, with diverse audiences, and via appropriate media and formats
5. **Integrative Reasoning** – (a) Understands their place in the world relative to historical, geopolitical, and intellectual trends, including the geographic, socio-cultural, economic, and ecological influences on these trends; (b) Perceives the world as an interdependent system, recognizing the effects of this system
on their lives and their personal influence on the system; (c) Understands how different disciplines contribute to knowledge of global processes, such as those related to health, food systems, energy and other areas; (d) Understands the cultural, disciplinary, and contextual role, potential, and limits of problem-solving techniques and that cultures and disciplines conceptualize data, methodologies, and solutions differently.

Connecting Assignments to the Goals

<table>
<thead>
<tr>
<th>Major Assignments</th>
<th>Relevant Program Goal(s)</th>
<th>Relevant MSU Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation Sessions</td>
<td>1, 2</td>
<td>2.a, 5a</td>
</tr>
<tr>
<td>Leadership and Participation</td>
<td>3, 4, 5</td>
<td>2.d, 3.a, 4.a</td>
</tr>
<tr>
<td>Papers and Final Project</td>
<td>1, 2, 3</td>
<td>1.a, 2a, 2.b, 2.c., 3.a, 3.b, 4.b, 5.b, 5.c, 5.d</td>
</tr>
<tr>
<td>Blog Posts and Comments</td>
<td>1, 2, 3, 4, 5</td>
<td>1.a, 2.a, 3.b, 4.b</td>
</tr>
</tbody>
</table>

Academic Information

Courses
Students going on this program can take 4 credits from amongst the options listed below. Students who want more than 4 credits or honors credit must consult with a faculty member for approval.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 475</td>
<td>International Studies in Biosystems Engineering</td>
<td>4 cr.</td>
</tr>
<tr>
<td>BE 491</td>
<td>Special Topics in Biosystems Engineering</td>
<td>4 cr.</td>
</tr>
<tr>
<td>EGR 475</td>
<td>Special Topics in International Engineering</td>
<td>4 cr.</td>
</tr>
<tr>
<td>ANR 475</td>
<td>Intertnl Studies Agric Nat Res</td>
<td>4 cr.</td>
</tr>
</tbody>
</table>

Credits
Students are required to enroll in a minimum of four (4) credits. All students must be fully enrolled to participate on the program. Students who fail to enroll for the correct courses and/or credit levels can have their student account billed to cover program expenses.

Students desiring more than four credits or honor’s options must complete additional work in the form of an independent study.

All students complete the same work regardless of their enrollments; however, they will tailor the existing assignments depending on their enrollment, needs, and interests. Students are encouraged to work with their academic advisors to select the courses that fit best with their major requirements and curriculum.

Academic Integrity
Plagiarism is a serious issue in college. Plagiarism happens any time you take an image, idea, or phrase from another source without citing it. Citations are needed for more than quotations; ideas taken from other sources should be cited. If you have questions about making citations, you should talk with your instructor. In general, citations should follow APA format.

This program follows the MSU Academic Integrity statement, Article 2.3.3 of the Academic Freedom Report, as detailed on the MSU Ombudsman page, which states that (http://www.msu.edu/unit/ombud/dishonestyFAQ.html): “The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards.”

In addition, the program adheres to the policies on academic honesty specified in General Student Regulation 1.0, Protection of Scholarship and Grades; the all-University Policy on Integrity of Scholarship and Grades; and Ordinance 17.00, Examinations. (See Spartan Life: Student Handbook and Resource Guide using the MSU Web site at http://www.msu.edu.)
Unless authorized by your instructor, you are expected to complete all course assignments, including homework, lab work, quizzes, tests and exams, without assistance from external experts or peers. You are expected to develop original work for this course; therefore, you may not submit course work you completed for another course to satisfy the requirements for this course. Also, you are not authorized to use the www.allmsu.com or similar Web site to complete any work in this course.

Students who violate MSU rules may receive a penalty grade, including but not limited to a failing grade on the assignment or in the course. Also note that plagiarism can be reported in your academic and student files, and can result in disciplinary action if it is habitual.

Assignments
Students can read specific guidelines for all assignments in ANGEL or at the end of this syllabus. Students are strongly encouraged to review the program goals and relevant rubrics before and while preparing their assignments. Instructors will evaluate student work based on these rubrics, which are in turn based on the program goals.

For information about submitting and formatting your work, please see below. Failure to follow directions is a common way that students lose points for this program.

Pre-departure work (30)
- Attendance/quizzes - 25 points
- Passport / Pre-departure data - 5 points

In-country work (300 points)
- Analytic reflections written/oral - 100 points (2 @ 50 points each)
- Blog - 50 points (1 time)
- Participation - 150 points
  - Engagement - 100 points (2 evaluations @ 50 points each)
  - Leadership - 50 points (1 time)

Re-entry work (370 points)
- Final project concept - 20 points
- Post-program blog update - 50 points
- Final project - 300 points

Grading and Evaluation
Students will receive a numeric grade according to the point scale below. To the extent possible, instructors will post grades to ANGEL. If students notice missing or miss-reported grades in ANGEL, they should let the faculty know ASAP.

Final grades are completed at the end of the program, with official final grades posted mid-March when the course officially ends (see the Schedule of Courses web site for more information).

<table>
<thead>
<tr>
<th>Grade*</th>
<th>Percentage of Possible Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>94 – 100%</td>
</tr>
<tr>
<td>3.5</td>
<td>88.5 – 93.9%</td>
</tr>
<tr>
<td>3.0</td>
<td>83.5 – 88.4%</td>
</tr>
<tr>
<td>2.5</td>
<td>78.5 – 83.4%</td>
</tr>
<tr>
<td>2.0</td>
<td>73.5 – 78.4%</td>
</tr>
<tr>
<td>1.5</td>
<td>68.5 – 73.4%</td>
</tr>
<tr>
<td>1.0</td>
<td>63.5 – 68.4%</td>
</tr>
<tr>
<td>0.0</td>
<td>under 63.4%</td>
</tr>
</tbody>
</table>

*Instructors may round grades up at their discretion.
Grading Standards
Sometimes students assume that study abroad programs provide an automatic 4.0. Students on this program must put forward high quality work to earn their grades for the program.

4.0 – Exceptional work; work greatly exceeds expectations and is free all but minor errors; work integrates course materials and shows thinking beyond the obvious; work exhibits new knowledge and understanding that connects varies ideas and perspectives

3.0 – Above average work; work generally exceeds expectations and is relatively free of errors; work integrates course materials

2.0 – Average work; work meets basic standards and expectations; work shows understanding of lesson materials and information

1.0 – Below average or poor work; work fails to meet class and instructor expectations; work contains many errors and is unacceptable for college-level effort; work does not clearly exhibit understanding of course concepts

0.0 – Failing; work incomplete or missing

Disputing Grades
At MSU, grades are the responsibility of the instructor and reflect your instructor’s evaluation of your work. If you have questions about how you have been assessed on your work or effort, you should contact the instructor as soon as possible after receiving the grade. Discussing options on a graded assignment should not be left until the end of the program, final project period, or after grades have been posted.

If you feel, after discussing the option with your instructor, that you are being treated in a manner that is unfair or inconsistent with this syllabus, then you should contact the department sponsoring the course under dispute or the Ombudsman.

Formatting Assignments
Students will hand-write their assignments while in-country. We ask that students take time to ensure that their writing is legible and ask that students print if their handwriting is difficult to read. We also ask that students avoid writing on the bus, as it makes the handwriting worse than normal.

To submit your assignments, please hand them to the instructor personally or slide them under their door; do not leave them outside the instructor’s door or with a hotel employee. When turning in assignments, please do it at the end of the day or when requested. Also, unless necessarily (i.e., you have a question) do not knock on the door to submit the assignment, just slide it under the door. Turning in papers at meal times or randomly during the day makes it harder for the faculty to keep track and care for your work. Assignments without a name or not matching the formatting guidelines will lose points.

For the final project, students should type using a 12-point font size, standard typeface (e.g., Arial, Times, etc.), double-spaced, and one inch margins. For specific typed format, citations, and bibliographies, students should follow standard APA format, fifth edition.

If you do not have a style guide, then you can look up appropriate information on-line or ask the instructor for help. One online resource available to you for APA citations is: http://citationmachine.net/. Students should also use appropriate citations for any web content taken from outside sources on their blogs.

To submit the final project, please post it to ANGEL or physically hand it in. DO NOT email your work (especially web pages) to the instructors unless given permission.

Late Work
Before and after travel, instructors will accept late assignments for up to five working days (days on which classes are held) past the due date with a 25% deduction (5% a day) from the total possible points.

Due to the short turn-around on assignments in-country, days will be converted into three hour blocks and follow the same system as on campus. In other words, turning in something in under three hours late will receive a 5% reduction, 3-6 hours is a 10% reduction, 6-9 hours is a 15% reduction, etc.
Students who have questions about an assignment should talk with the instructor before the assignment is due. Not understanding the guidelines or due dates is not an excuse for late or poor quality work.

Students who will miss due dates due to official MSU trips or events should make arrangements with their instructor to turn in any assignments they will miss. Students will receive a 0.0 for all pre-departure work not completed by the program departure date.

Extensions are possible for the final project or in specific instances in-country if students request one prior to the assignment due date. Requests for extensions on re-entry work will result in an “incomplete” grade. Incompletes must be finished by the middle of fall semester.

**Program Schedule and Logistics**

**Holidays, Observances, and Special Needs**

Per the Ombudsman’s web site (http://www.msu.edu/unit/ombud/excuses.html), the Policy on Religious Observance asks that faculty and staff “be sensitive to the observance of [religious] holidays so that students who absent themselves from classes on these days are not seriously disadvantaged. . . .It is the responsibility of those students who wish to be absent to make arrangements in advance with their instructors.”

Hence, if students have needs related to religious holidays, observances, or customs, they should let the instructors know as soon as possible.

For physical or cognitive disabilities and/or special needs while abroad, students should also follow the MSU Policy. Per the RCPD (http://www.rcpd.msu.edu/): Students and employees requesting accommodations must provide appropriate documentation of their disability. Students will meet with a Disability Specialist for an individual needs assessment to determine reasonable accommodations. After meeting with their supervisor, employees may contact the Disability Resource Coordinator for assistance with the accommodation request process.

Michigan State University is committed to providing equal opportunity for participation in all programs, services, and activities. Accommodations for persons with disabilities may be requested by contacting the program instructor as soon as possible after acceptance into the program. Requests received after this date will be honored whenever possible.

If you have special dietary needs for religious, health, or medical reasons, you need to let the instructor know prior to departure. You also should make arrangements with the airlines to ensure that they will have food to meet your needs on the flight. The instructors will make every effort to accommodate special dietary needs by communicating such needs to the persons handling our food in-country. If you find the food unacceptable due to a special dietary need while in-country, you should contact the instructor immediately.

**Pre-Departure (November 2012 – early December 2012)**

Prior to departure, students will have (2) 3-hour and (1) 2-hour seminars to prepare them for their time abroad. These sessions will include one sessions related to program management and two sessions related to program content, including sessions about Costa Rican geography, history, culture, language, economy, biomass, biomass energy, water, ecosystem services, sustainability, engineering design and program logistics.

As part of these sessions, students will complete some short assignments, tasks, and readings, which the instructors will post to ANGEL or do during the seminar. Students who need to miss orientation sessions will need to do extra work to make-up material missed during these sessions.

In addition to the formal class sessions, the group may have additional social activity options. Students are encouraged, but not required, to participate in these activities unless otherwise noted in class or over email.

Beyond our time together as a group, the instructors encourage all students to conduct research before departure in the areas of current events, topics relevant to your days as leader, and/or their final project. The instructors also strongly suggest that you purchase a travel guide relevant to Costa Rica and that you take time to read the major newspapers from the region:

• Lonely Planet - Costa Rica - http://www.lonelyplanet.com/costa-rica
• Tico Times Weekly Edition Newspaper - http://www.ticotimes.net/
• Universidad de Costa Rica - http://www.ucr.ac.cr/
• On-line newspapers - http://www.onlinenewspapers.com/costaric.htm
• CNN.com - Costa Rica http://topics.cnn.com/topics/costa_rica
• Yahoo Weather – Cost Rica - http://weather.yahoo.com/costa-rica/
• The Economist country guides -- http://www.economist.com/topics/costa-rica

Program Schedule
Prior to departure, the faculty members will provide students with a general itinerary for the program. Please
note that this itinerary will be subject to change for a variety of reasons, including—but not limited to—weather,
emergencies, host needs, etc. Students should view all schedules as drafts and seek daily updates.

Generally, the program will start each day with breakfast and conclude with dinner. On some occasions, there
will be group discussions or activities at night. During scheduled time with the group, students should conduct
themselves as representatives of the university and refrain from drinking alcohol, unless otherwise noted (e.g.,
we visit a winery or the host provides a drink to us).

At the start and end of each day, instructors will make announcements relevant to the program’s itinerary,
weather, meals, expectations, etc. Students are responsible for these announcements, and failure to show up
prepared and on-time will result in deductions from students’ participation grades (see participation and
engagement).

Itinerary, Accommodations, Academic Topics, Day Leaders
The general itinerary for the 2012 program is below.

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Transportation</th>
<th>Accommodations</th>
<th>Academic Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sat., Dec. 15, 2012</td>
<td>International flights organized by MSU - transfer to hotel provided by hotel UCR minibus (Local to group session - Fabio)</td>
<td>Adventure Inn Hotel 011 506 2239 2633 <a href="http://www.adventure-inn.com">www.adventure-inn.com</a></td>
<td>General overview of program - shared presentations between UCR and MSU including MSU senior capstone and study abroad presentations. Fabio 10 am - 4 pm Fabio - 7 km - 4-7 pm presentations <a href="http://www.ingagri.ucr.ac.cr/sites/default/files/images/AficheEscuela.jpg">http://www.ingagri.ucr.ac.cr/sites/default/files/images/AficheEscuela.jpg</a></td>
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<tr>
<td>2</td>
<td>Sun., Dec. 16, 2012</td>
<td>UCR minibus 17.8 km – about 21 mins am to San Jose 84.1 km – about 1 hour 11 mins pm to OTS - La Selva</td>
<td>Organization for Tropical Studies (OTS), La Selva 011 506 2766 6565 La Selva Station <a href="http://www.ots.ac.cr">www.ots.ac.cr</a></td>
<td>History, Culture, UCR - campus tour, National Museum Day Leader - Anh B. Breakfast - Adventure Inn 9 am departure 9:30 am UCR pickup <a href="http://www.ucr.ac.cr/">http://www.ucr.ac.cr/</a> <a href="http://www.ingagri.ucr.ac.cr/">http://www.ingagri.ucr.ac.cr/</a> National Museum Open 9am-4:30pm <a href="http://www.museocostarica.go.cr">http://www.museocostarica.go.cr</a> UCR campus walking tour 3 pm departure 2 hr drive 6 pm Dinner</td>
</tr>
<tr>
<td>Day</td>
<td>Date</td>
<td>Transportation</td>
<td>Accommodations</td>
<td>Academic Topics</td>
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</tr>
<tr>
<td>3</td>
<td>Mon., Dec. 17, 2012</td>
<td>UCR minibus</td>
<td>Organization for Tropical Studies (OTS), La Selva</td>
<td><strong>Biodiversity, Wet Tropics, ecosystems plant selection</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local only</td>
<td>011 506 2766 6565</td>
<td>Day Leader - Luke D.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>La Selva Station</td>
<td><a href="http://www.ots.ac.cr">www.ots.ac.cr</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="http://www.ots.ac.cr">www.ots.ac.cr</a></td>
<td>6:30am Breakfast</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8:00-11:00am - Guided Walk</td>
<td>Noon - Lunch</td>
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<td></td>
<td></td>
<td></td>
<td>Noon - Lunch</td>
<td>Pm - possible OTS guest lecture</td>
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<td></td>
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<td></td>
<td>Pm - floating mat design</td>
<td>Debrief</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>6pm Dinner</td>
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<td></td>
<td></td>
<td></td>
<td>Debrief</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Tue., Dec. 18, 2012</td>
<td>UCR minibus</td>
<td>Turrialba / Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE)</td>
<td><strong>Experimental Station La Rita-CORBANA</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>54.0 km – about 49 mins am to La Rita; 51.2 km – about 1 hour 4 mins am to Siquirres; 55.2 km – about 1 hour 5 mins pm to Turrialba</td>
<td>011 506 2558 2000</td>
<td><strong>San Alberto Farm / Pococi, Limon</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="http://www.catie.ac.cr/magazin.asp?CodIdioma=ESP">www.catie.ac.cr/magazin.asp?CodIdioma=ESP</a></td>
<td>Day Leader - Mariana M.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="http://www.corbana.co.cr/">http://www.corbana.co.cr/</a></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Bananas</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>6:30am Breakfast</td>
<td></td>
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<td></td>
<td>9:00 am Reception</td>
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<td>9:20 am Chemical Lab</td>
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<td>9:45 am Phytoprotection Lab</td>
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<td>10:10 am Netamothology lab</td>
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<td></td>
<td>10:35 am Molecular biology Lab</td>
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<td>11:00 am Biological control Lab</td>
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<td>11:25 am Drive to 28 millas</td>
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<td>Noon - Lunch in route</td>
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<td>2:00 pm Visit to Farm San Pablo</td>
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<td>4:00 pm Departure to CATIE</td>
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<td>6 pm dinner CATIE</td>
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<td></td>
<td>Debrief</td>
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<td>Day</td>
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<td>Transportation</td>
<td>Accommodations</td>
<td>Academic Topics</td>
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<td>5</td>
<td>Wed., Dec. 19, 2012</td>
<td>UCR minibus</td>
<td>Hotel Guadalupe, Tilaran</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>011 506 2695 5943</td>
<td><strong>Sustainable agriculture and natural resource management/watershed management</strong></td>
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<td>Day Leader - Ben T.</td>
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<td><a href="http://www.catie.ac.cr/magazin.asp?CodIdioma=ESP">http://www.catie.ac.cr/magazin.asp?CodIdioma=ESP</a></td>
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<td>7 am breakfast CATIE</td>
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<td>10 am Watershed Management - Sergio Velásquez</td>
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<td>11:30 am - Lunch CATIE</td>
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<td>Pm - Botanical Garden Tour - Werner Rodriguez - Open 7am-4pm</td>
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<td>Leave by 3 pm</td>
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<td>Dinner - Tilaran</td>
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<td>6</td>
<td>Thur., Dec. 20, 2012</td>
<td>UCR minibus</td>
<td>Hotel Guadalupe, Tilaran</td>
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<tr>
<td></td>
<td></td>
<td>Local</td>
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<td><strong>ICE - Energy systems (hydro and wind), biomass and water footprints</strong></td>
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<td>Day Leader - Demetris I.</td>
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<td><a href="http://www.grupoice.com/wps/portal/">http://www.grupoice.com/wps/portal/</a></td>
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<td>7 am Breakfast - Hotel Guadalupe</td>
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<td>ICE tours - likely 8 am departure</td>
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<td>Debrief</td>
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<td>7</td>
<td>Fri., Dec. 21, 2012</td>
<td>UCR minibus</td>
<td>Hotel Guadalupe, Tilaran</td>
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<td>Local</td>
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<td><strong>Biomass and water footprints/ reflection - local tourism.</strong></td>
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<td>Day Leader - Demetris I.</td>
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<td>7 am Breakfast - Hotel Guadalupe</td>
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<td></td>
<td>Engagement evaluation due</td>
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<td>Written/Oral reflection due</td>
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<td>Day</td>
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<td>Transportation</td>
<td>Accommodations</td>
<td>Academic Topics</td>
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<td>9</td>
<td>Sun., Dec. 23, 2012</td>
<td>UCR minibus Local only</td>
<td>Universidad EARTH, Finca La Flor, Liberia</td>
<td>Biomass and water footprints/ reflection - local tourism.  Planning for Fabio Baudrit project.  Day Leader - Allison V.  Breakfast - Earth  Playa Panamá or Hermosa day trip  <strong>Debrief - Fabio project planning</strong></td>
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<tr>
<td>Day</td>
<td>Date</td>
<td>Transportation</td>
<td>Accommodations</td>
<td>Academic Topics</td>
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| 11  | Tue., Dec. 25, 2012 | None | Monte Verde (UGA)  
www.externalaffairs.uga.edu/costa_rica/index.php | Christmas, hike to San Luis waterfall, coffee tour  
Day Leader - Kelsey D.  
7:30 am - Breakfast - UGA  
8:30 am - waterfall hike or possibly zip line  
12 pm - Lunch UGA  
1 pm - Coffee plantation visit  
6 pm - Dinner - UGA  
7 pm - Night hike |
128 km – about 2 hours 26 mins to Alajuela x 2 | Adventure Inn Hotel  
011 506 2239 2633  
www.adventure-inn.com | Biomass energy systems/wetlands/project/ecosystem service design and evaluation  
Day Leader - Alex W.  
6:20 am - Milking  
7:30 am - Breakfast - UGA  
Check out  
Driver to pick us up at 8:00 am  
Pm Project - Fabio  
• Anaerobic Digester / Wetland design  
• Emergy analysis  
• Floating mat construction  
• System inventory |
| 13  | Thur., Dec. 27, 2012 | UCR minibus  
Local only | Adventure Inn Hotel  
011 506 2239 2633  
www.adventure-inn.com | Fabio Baudrit project - Biomass energy systems/wetlands/project/ecosystem installation, design and evaluation  
Day Leader - Katie B.  
Breakfast - Adventure Inn  
All day - Project - Fabio  
• Anaerobic Digester / Wetland design  
• Emergy analysis  
• Floating mat construction  
• System inventory  
Engagement evaluation due |
Itinerary - Daily transportation, accommodations, and academic topics.

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<tr>
<th>Day</th>
<th>Date</th>
<th>Transportation</th>
<th>Accommodations</th>
<th>Academic Topics</th>
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</table>
| 14  | Fri., Dec. 28, 2012 | UCR minibus
Local only | Adventure Inn Hotel
011 506 2239 2633
www.adventure-inn.com | Fabio Baudrit project - Biomass energy systems/wetlands/project/ecosystem installation, design and evaluation / Final Dinner
Day Leader - Robbie K.
Breakfast - Adventure Inn
Am - Project - Fabio
• Anaerobic Digester / Wetland design
• Emergy analysis
• Floating mat construction
• System inventory
Written/Oral reflection due |

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<tr>
<th>Day</th>
<th>Date</th>
<th>Transportation</th>
<th>Accommodations</th>
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</table>
| 15  | Sat., Dec. 29, 2012 | Airport
Hotel shuttle | Travel day - return to US |

Program Readings
Select readings will be taken from approximately 20 Costa Rican technical books, journals and web sites. Course pack will be provided on Angel in pdf format.

Engagement and Participation

Attendance and Tardiness
Attendance for all academic sessions and activities is mandatory.

Prior to departure, absences should be the exception not the rule and result from extenuating circumstances. Students who have class or work conflicts with orientation sessions will need to complete additional online work to meet contact hour requirements. Students who miss a session can find all materials from the orientation session folder on ANGEL. Excessive tardiness or missing sessions will result in lowered participation points unless alternative work arrangements are completed.

Once in Costa Rica, the instructors expect all students to arrive on time and prepared for the day’s activities, including having appropriate dress and academic materials. Students are responsible for obtaining any information or materials missed due to tardiness or an absence and should contact the instructor as soon as possible if they miss a session or visit. Please see the participation and engagement section and the late assignments section for more information. Excessive tardiness or missing official activities while abroad will result in lowered participation points.

For more detail on the official MSU policy related to missing class, please see the information on-line at http://www.msu.edu/unit/ombud/excuses.html. Please note that getting lost, alarm failure, or not owning a watch are not considered appropriate excuses for being late or missing a session. While in country, the instructor recommends working with your friends and roommates to make sure everyone is on time and in the right location.

Calling home for non-emergencies, buying supplies (i.e., batteries), eating, getting money, and other personal responsibilities are also not appropriate reasons for missing class or being late. Students must use their time wisely while abroad. Also, illness that results from an individual’s poor decision-making (e.g., being hung-over) may or may not be excused depending on the circumstances.
The instructor will work with students on a case-by-case basis for excessive absences due to official MSU activities, religious reasons, illness, or other serious emergencies. In certain cases, instructors will require documentation of the event, illness, etc. **Students missing orientation/overseas activity for a planned event (e.g., conference, religious holiday or observance, class trip, etc.) must submit a written request as soon as possible before missing the session.** Students missing a session or activity for unexpected reasons should contact the instructor as soon as possible.

**Participation and Engagement**

During all sessions and visits, the instructors expect students to be fully engaged and prepared to discuss reading assignments. Students are strongly encouraged to ask questions of the instructor, guest speakers, and their peers.

Active participation includes, but is not limited to, the following behaviors:

1. Asking and answering questions of the instructors, peers, or guest speakers;
2. Bringing forth new ideas, information, or perspectives to academic conversations;
3. Discussing your readings and reflections with an instructors and peers;
4. Meeting with the instructors to discuss your interests, assignments, or project;
5. Questioning information presented and discussed;
6. Participating small group discussions and activities;
7. Assisting in the daily running and maintenance of the program (i.e., helping out while overseas);
8. Exhibiting leadership and volunteerism consistent with the goals and maintenance of the program;
9. Refraining from drinking alcohol—unless otherwise noted—during all formal program activities; and
10. Assuming responsibility for personal behavior and learning.

While studying abroad, students should be mindful that things will change and that they are guests in another culture; therefore, it is important for all participants to exercise:

- Respect for themselves, each other, and our hosts;
- Openness and a positive attitude toward new ideas and experiences;
- Flexibility and tolerance of ambiguity; and
- Good communications amongst themselves and with the faculty.

**NOTE:** When working with indigenous people, please be mindful of cultural differences, especially as related to religion, photography, and drinking.

**Technology Use**

Technology is a valuable tool when used appropriately. While in sessions on campus and abroad, students should put their cell phones to silent or turn them off. Also, students should refrain from sending and/or reading text or email messages during formal class sessions.

In relationship to taking photographs, we strongly encourage students to take them while abroad, but we cannot have students being distracted by photography when they should be listening to the speaker or engaging in an activity. To the extent possible, the instructors will give students time to take photos, call home, check email, etc. When in a formal session, students should put academics first and the rest of these issues second.

Students will have intermittent access to the Internet while abroad. Often they will have access in the accommodation, but more often, they will need to use Internet cafés. There will be times when we are in remote areas, and we may have no access to the Internet for a day or two.

**Assignments**

This section details the assignments required of all students on the program. Students who desire honor’s credit or extra credits will need to design an independent project beyond the work detailed below.

Additional details about this work may be posted on ANGEL.
Pre-Departure Work

Trip Preparation (30 points) - As a means of getting ready to depart on the program, students will complete some administrative tasks that will facilitate their travel. These tasks include:

- Attending and actively participating in orientations
- Completing an information sheet
- Writing a biography and having a picture taken for posting on-line
- Providing the faculty with information about dietary and health needs
- Providing the faculty with emergency contact information
- Completing required forms
- Turning in a copy of your passport

Students will attend the scheduled academic sessions and participate in activities and discussions related to the program’s themes. If students cannot attend a session for some reason, then they must complete the online work and take an on-line quiz to fulfill the contact-hour and content requirements. All pre-departure work must be submitted before leaving for Costa Rica. Work not turned in prior to departure will receive a “0”.

In-Country Work

Analytical Responses (100 points) - Students will complete two analytical response essays, with each one relating to readings, lectures, site visits and course themes. The purposes of the responses are to consider, compare and contrast, and question events and activities from the time spent abroad. Students will respond to each of the following topics

1. Students will design select components of the ECPA bioenergy and ecosystem systems and will participate in select installations. Designs will incorporate international context, material limitations, units and language; and include ecosystem services.

2. Students will trace and account for the biomass, water, and energy footprints/lifecycles for two of three crops (rice, bananas or coffee) produced in Costa Rica, used in Costa Rica and/or exported to the US from production to post-consumption.

3. Students will research, analyze and recommend engineering practices which would reduce the carbon, water and energy footprints/lifecycles of these commodities.

Students should not simply regurgitate a blow-by-blow of what they did for the day or what they read; rather, they should show an understanding of the connection between the reading, activities, and their own, original thinking. Instructors will collect and evaluate responses periodically while overseas. They may also use the responses as the basis for discussions with students or with the entire group.

Students will turn in these forms when directed in-country no later than 9:30 p.m. at night. When turning in the documents, students should turn them in, in-person or slip them under a hotel door. After 9:30, papers should just be passed under the door. DO NOT WAKE UP INSTRUCTORS TO TURN IN WORK UNLESS OTHERWISE DIRECTED. Do not give instructors work during field activities or give work to hotel employees.

Participation and engagement (100 points) - To earn full credit for daily engagement, students should actively participate in discussions before and during the trip. To participate effectively, students must contribute quality thoughts and ideas that connect ideas, not just talk (see participation and engagement section of the syllabus for more information).

To evaluate engagement and provide students with feedback, students will complete entries about once a week (see coursepack for the forms).

As with the analytic responses, students should turn in these forms when directed no later than 9:30 p.m. at night either in-person or by slipping them under a hotel door. After 9:30 p.m., papers should just be passed
under the door. DO NOT WAKE UP INSTRUCTORS TO TURN IN WORK UNLESS OTHERWISE DIRECTED. Do not give
instructors work during field activities or give work to hotel employees.

Day Leadership/Thank you Notes/Emails (50 points) - While in-country, student will take responsibility for
“leading” the group for a day. These responsibilities will include (see worksheet for full list):
• Assisting with check-in/check-out at accommodations;
• Assisting with shopping and meals;
• Briefing the group about the day’s schedule, restroom stops, etc.;
• Greeting, orienting, and introducing all guest speakers to the group;
• Thanking guest speakers with gifts (provided);
• Collecting guest speakers’ names, titles, and full mailing address;
• Writing thank you notes; and
• Taking digital pictures.

Each student must do one blog for the program (see below). The student-leaders also will assist with additional
duties, which may include helping distribute materials, organizing meals, making decisions, helping with check-in
or check-out at accommodations, etc.

Students writing a thank you note should prepare a unique, hand-written note or email to each host for the day
(i.e., the main contact or senior person for each site: NOT all individuals at each site). These notes should be
written, addressed, and given to the instructors within 48 hours. Late notes or notes with incomplete
information will receive a point deduction.

Good leaders will have done their “homework” for the day and have a general sense of the day’s schedule and
content. They will also be prepared with appropriate numbers of gifts for each day. If leaders are late, forgetful
of their duties, or perform unprofessionally, then they will receive a point deduction. Program faculty and
students assistants will meet with the day leaders in the morning to brief them on any changes or special
considerations, and a student assistant will be available at night to help with the web site.

Blog/Blog Comments (50 points) - each student will prepare a blog about the day. This blog should include:
1. A two paragraph summary of content related to the day’s lessons and discusses personal observations
related to their final project.
2. Four to six digital photos taken by the leaders. Most of these photos should be somewhat serious and
have a content-related caption, the remaining photo or photos can be fun and silly (yet appropriate!).
3. Any appropriate related links associated with our days.

Blogs should be completed nightly, unless otherwise specified by the instructor. Blogs not completed in a timely
fashion will receive point deductions. Exceptions will be made if Internet access is unavailable; however,
students can still have their posts written and photos selected.

In addition to completing the blog, all students are responsible for assisting the group with monitoring the blog
and responding to questions and comments from the public. All students must respond or comment at least two
times during the program (one per week). These postings should be substantive answers or ideas, not just one
word responses or personal sentiments.

Re-Entry Work
Immediate Post-Trip Work (70 points) - As a means of getting ready to complete a comprehensive final project,
students will complete two administrative tasks upon their return to the US. These tasks include:
• Determine a topic and complete an outline for your final project (Due January 14, 2013)
• Edit, revise and polish your in-country blog (Due January 14, 2013)

Final Project (300 points) - All students will complete an original research project that involves using ecosystems
engineering to design and analyze sustainability of anthropogenic systems to produce water, energy, and food.
The ECPA demonstration sites and ICE production sites will be used for references.

Each student will decide the focus for his or her effort, but each project must: (1) relate to the concept of
sustainability, international engineering, ecosystem services; (2) involve the collection of primary data while in
Costa Rica (i.e., you need to read, observe, ask questions, or interview people while abroad); and (3) focus on Costa Rica in a comparative or primary context (i.e., discuss Costa Rica or compare Costa to the U.S.).

When completing their assignments, students should look toward completing a final paper of about 10 pages or the equivalent of this effort. This paper (or project) should include:

1. **Introduction** (1.5 pages)—Introduce topic, explain its importance, define key terms and the problem being investigated.
2. **Secondary research** (2 pages)—Provide background reading and ideas related to the topic based on scholarly or valid sources (i.e., not based on Wikipedia or the Internet).
3. **Methods** (.5 pages)—Explain how you did your research/observations in Costa Rica.
4. **Findings** (5 pages)—Describe what you found in Costa Rica doing primary research including design drawings, material lists, protocols and specifications.
5. **Implications** (3 pages)—State what you have learned, answer your research question, make recommendations for action.

When choosing a topic and designing a focus, students should consider the depth and breadth of the topic. Good projects are specific enough to be manageable but broad enough that students will be able to find primary and secondary material about them.

In relationship to the problem statement, students can think of the problem like a thesis statement for a typical analytical paper. The major difference here is that the students will do some primary research of their own and devise their own “solutions” to the problem investigated. The problem statement identifies the need for the study and helps outline the research process. Well written questions suggest a tension between two opposing “facts” or ideas. For example:

a. **Statement 1:** Water is a scarce resource and increasingly limited in availability in Costa Rica only because of quality.

b. **Statement 2:** Costa Rican farmers rely on water for crop production.

c. **Problem Statement:** Given water availability and quality, what can be done in Costa Rica to address clean energy and food production from an economic standpoint?

To assist you with writing the paper, you should consider creating an outline that will guide your writing and do some background reading before departure. To provide you with time while in country, we have set-aside several working days for you while abroad. To the extent that you plan ahead, we can work with you to identify locations or people that you could visit to augment your research on those days. You can also feel free to interview our hosts, guides, and guest lecturers, but you should plan ahead.

Papers should include a cover page and follow the guidelines detailed in the syllabus. All assignments should include a bibliography. Final assignments are due on March 11, 2013.