

**ENGINEERING FOR SUSTAINABLE DEVELOPMENT**  
*Renewable energy systems, environment conservation and humanitarian aid*

## FIELD STUDY ABROAD

*Travel, Learn, Research and Work in developing communities*



Field  
Study  
Abroad

## FSA#15 – Central America

*from 7<sup>th</sup> August 2019 to 5<sup>th</sup> September 2019*



**“Abroad you will discover different cultures, you will develop new perspectives and abandoning the daily life, you will improve your social and cultural awareness, which will make you valid for any team.”**

**(Mary Boyce, Head of Department of Engineering at Columbia University)**

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## 1. Overview

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Universities all around the world are gaining a key role in **sustainable development** and **cooperation** through an increasing number of graduates and PhDs focused on these topics.

There is also a **need to reduce distances between the technical view of cooperation and the social sciences**, as well as between the didactics and the **practical experience on field**. Professionals from the technical, economic and social sectors involved in development cooperation are called to interact in interdisciplinary and transnational contexts. Such skill has nowadays become essential for a meaningful and sustainable contribution within the working environment.

This is the goal of the course "Engineering for Developing Communities (EDC)" at Columbia University, New York, of the "Co-operation and Design for Development (CDD)" course at the Sapienza University of Rome, "Global Leadership and Sustainable Development "(GDLS) of Hawaii Pacific University and the Center for Sustainable Development (CSD) at the University of Cambridge (UK).

Interactions among these matters are well elaborated during the **Field Study Abroad** promoted by the Interuniversity Research Center for Sustainable Development, **CIRPS**, of the University of Rome "La Sapienza" and the non-profit organization, **Tecnologie Solidali**, with the advisory of **Meridiana Energy consulting**, an innovative start-up, founded in 2014 with the aim of promoting the development and dissemination of sustainable technologies for society and the environment.

Field Study Abroad places students within an international **project management in the field of sustainable development and renewable energies, covering all phases from prefeasibility studies, to project design, construction until monitoring and final evaluation**; topics are approached with academic methodology and research purposes in order to involve students in scientific discussions.

Further goal of the FSA is the preparation of young professionals capable to discuss technological, political and social solutions to be addressed to the challenges of developing countries in both urban and rural areas, with a participatory approach regarding the identification of needs.

The characteristic approach of the FSA lies in the concept of "**learning by doing**", with frontal lessons during field activities, as well promoting students' engagements with Universities, International Organizations and Public Institutions for internships, trainings or job opportunities.

From 2014 Field Study Abroad has seen 13 editions, mainly in Central and Latin America, counting on more than 200 participants.

The Field Study Abroad had a **nomination of excellence** in the Italia Decide Award 2018, **for the Technological Innovation of Sustainable Development** and specifically as the Innovation of higher education. The awards took place on the occasion of the presentation of the "ITALIADECIDE 2018 Report" at the Sala della Regina of the Chamber of Deputies, in the presence of the President of the Republic, Sergio Mattarella. The award was received by prof. Andrea Micangeli, FSA Founder and FSA staff

**Field Study Abroad 15<sup>th</sup> will take place in North and Central America from 7<sup>th</sup> Aug to 5<sup>th</sup> Sept 2019.**

## 2. Co-organising partners

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### 2.1 Cirps

University of Rome Sapienza started the Interuniversity Research Center for Sustainable Development (CIRPS) that has been active since 1988 and is involved in research, training, services, work methods and direct interventions on the territory, focusing on the spread of technical and scientific solutions to achieve a social, economic and technological development capable of ensuring growth and sharing of well-being without penalizing the environment, nor any social group, geographical area or future generation. It carries out its activity through partnerships and agreements with universities, research centers, businesses and national and international institutions. In particular: it focuses on local, regional, national, European and international sustainable development, and it seeks for new technologies and applications; it promotes initiatives for science and interdisciplinary collaborations in the universities, departments and research centers; it helps small and medium-sized enterprises, national and international institutions, governmental and non-governmental organizations, in particular those from developing countries, the European Union and the United Nations (UNESCO, UNICEF, UNDP), in the choice and analysis of feasibility of cooperation programs and projects and in their realization.

Field Study Abroad is part of the innovative training activities promoted by the research center and gives the opportunity to participate in the ongoing projects managed by the CIRPS.

### 2.2 Tecnologie Solidali

Further research is needed in order to achieve results that could make some people's lives better.

For instance, some researchers have great ideas, but they do not have anything to develop them, especially because of lack of funding.

The association Tecnologie Solidali (Responsible Technologies) proposes to support this type of research initiatives, in particular in the field of technologies that reduce the damage caused by the war, the sustainable development of the weaker societies, the safeguarding and care of the environment, the autonomy of people with disabilities, and all those fields of social interest in which scientific development and technological innovation can produce new inestimable values for people's lives. This non-profit organization cares about the logistical and organizational aspects of Field Study Abroad.

### 2.3 Meridiana Energy

Meridiana Energy was born from the experience gained by a group of young engineers specialized in the energy field, and bases its guidelines on improving energy efficiency, and actively researching technical solutions to reduce pollution and improve the quality of life, also thanks to small daily choices.

It always looks at collaborations with international research centers on rural electrification and cooperation topics: low carbon technologies assistance for climate change adaptation and mitigation actions, rural electrification projects development and implementation, with focus on productive energy and water&sanitation. Carlo Tacconelli, Meridiana Energy Technical Director, is one of the main trainers of Field Study Abroad.

### 3. Field Study Abroad XV – Central America

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#### 3.1 Admission requirements and course duration

- **Admission requirements:** any student, regardless of age and nationality, interested in a university education in a related field can participate in the Field Study Abroad.
- **1 month course + 1 optional internship,** for an additional period of work experience

#### 3.2 Topics

- **Renewable energies:** wind turbines, photovoltaic systems, hydroelectric power generation, waste to energy systems, smart grids, urban and rural electrification. Agronomy and food processing technologies are discussed within the international cooperation for development on the purpose of finding appropriate solutions to identified problems; students can develop their thesis or project work directly on the field;
- **Project management tools:** Logical Framework Analysis, stakeholder analysis, environmental impact assessment, project monitoring and evaluation.
- **Financial evaluation:** funding opportunities, public-private partnerships, business planning, fundraising and management.
- **Feasibility study:** field survey methods, data collection, desktop analysis, need assessment, cross-cutting issues.
- The course also offers the opportunity to acquire and implement their knowledge in the areas of **international cooperation**, political sciences and communication and their application both on the theoretical and on the practical level. Social impact of projects: field work involves a direct relationship with the rural realities of Central America, with the poverty and real problems of community. One of the core aims of the course is to encourage local communities to organize cultural and commercial initiatives that can represent development tools for the area and design together with their innovative solutions without distorting their uses and customs.

#### 3.3 “Learning by doing” approach

A direct field intervention is essential for an excellent engineering preparation and engineering is one of the most important disciplines that can contribute to sustainable development.

The innovative methodology of the course is the concept of "learning by doing", to learn on the field.

The course is based on "research by doing": it combines the theoretical aspects of design with the practical experience of working experience, giving great importance to field data collection and identification of the indicators required for evaluation of the intervention.

During the course, tutors assign project works to individuals or group of students who will be responsible for finding solutions, then the students, together with the tutors, who are specialized and experienced engineers, work on elaborating the entire project.

All topics will be explored both on theoretical aspects and on field work, enabling participants to develop appropriate solutions and gaining experience in preparation of action plans:

- The student has the opportunity to identify the appropriate solutions to the context in which he intervenes;
- Developing proposals;
- Preparing action plan
- Switching to implementation;
- Monitoring;
- Managing projects between studies and applications.

### 3.4 University contacts and partner institutions

The course also gives the students the opportunity to get in touch with universities, international organizations and electric companies, thanks to numerous meetings that are organized during the study period and which can host FSA participants for internships or work experience (the stage is for individual students, but in some cases a small group of two to three students is allowed).

- **Universities and Centres for research**

1. Università "Sapienza" di Roma - Roma
2. Universidad Nacional Autonoma de Honduras, UNAH - Tegucigalpa
3. Universidad de Costa Rica, UCR – San José
4. Universidad Nacional de Costa Rica, UNA – San José
5. Earth (private, non-profit, international University of Costarica) – San José
6. Columbia University di New York – New York
7. MIT Energy Initiative - Boston
8. SUNY College of Environmental Science and Forestry - New York

- **Partner institutions and companies:**

1. UNDP – United Nations Development Programme – Tegucigalpa, Honduras
2. RE.TE. ONG – Organizzazione non governativa per lo sviluppo umano - Tegucigalpa, Honduras
3. MOSEF - Proyecto Modernización del Sector Forestal de Honduras - Tegucigalpa, Honduras
4. FHIA - Fundación Hondureña de Investigación Agrícola - Region of La Ceiba, Honduras
5. PANAM - Parque Nacional La Muralla, Honduras
6. FINCA SAN BLAS – Azienda agricola sperimentale e sostenibile – Coyolito, Guanacaste, Costa Rica
7. ENEL GREEN POWER – San José, Costa Rica
8. ICE – Istituto Nazionale per l'Energia elettrica e la comunicazione - San José, Costa Rica
9. SIEPAC - Central American Electrical Interconnection System - San José, Costa Rica
10. Soluciones Integrales en Energia Alternativa – San José, Costa Rica

### 3.5 Course Mode – Students & Teachers

Most of the work, leisure and social activities, as well as the daily routine will be agreed between students and teachers: **teamworking** skills and availability are required from each participant.

Before field visits every project will be presented during front-stand classes, adequate support material and tips on the socio-economic context.

Output from field works will be agreed according to each participant's need or expectations.

The final program will be published prior to departure and will be coordinated throughout the trip with daily briefing in situ in case of necessary modifications.

The process of problem solving, as well as the results of each group, will be shared with other groups in a necessary exchange of information and methodologies.

Teachers will follow the daily work, allowing time for personal study.

### 3.6 Didactic

#### ● 175 hours, 50% dedicated to visit and field work:

- 60h Classes C
- 28h Exercises E
- 31h Field visits FV
- 56h Individual and group field work FW

#### ● Preliminary Issues to Design and Manage a Field Project: 4 h

- Class overview; teacher and projects overview, class and student objectives 1C
- Definitions of design, sustainability, development, technology, energy/water systems 1C
- Role of Global Engineering in Sustainable Development, and MDGs Projects 1C
- Role of energy for sustainable development in emerging countries 1C

#### ● Logical Framework Analysis: 12 h

- LFA I (Logic and Indicators) 6C & E
- LFA II (Results, Impact evaluation) 6C & E

#### ● Energy & Sustainable Development: technical, social, economic and environmental dimensions

##### Technical Dimension: 36 h

- Renewable Energy Sources, Plant, Design, Cost and Management 4 C
- Hydroelectric plant, Design and Management 3 C, FV
- Photovoltaic plant, Design and Management 6 CFV, FW
- Wind plant, Design and Management 6 FV
- Waste to Energy Plant, Design and Management 6 C, FV
- Micro PV System 2 C, FV
- Smart Grids for Rural and Industrial application in developing areas 12C, FW

● **Economical Dimension: 15 h**

- Energy Policies and Enterprises in East Africa 4 C
- Business Plan for Rural Electrification 2 C & FV
- Occupational Issues 2 C & FV
- Funding opportunities 4 C & FV
- How to write a Business Plan 3 C

● **Environmental Conservation: 12 h**

- Climate change adaptation and mitigation actions 5 C
- Multi Criteria Analysis Deforestation and Biomass 2 C
- Eco Systems: Local plants and wildlife 2 C & FV

● **Psychological and Social Context: 18 h**

- Basic events of East Africa History 2 C
- Cultural elements of East Africa 6 C
- Energy and MDGs in the Stakeholder analysis 2 C & E
- Pillars of ethic persuasion 4 C & FV

● **Field Work Case studies for Technical Design and Business Plan Development: 78 h**

- Quinto Village PV smart grid - Honduras 25FW
- El Diptamo mini hydro system - Honduras 25FW
- Minas Arriba coffee farmers water and energy - Guatemala 25FW

### 3.7 Students, partner organizations and local communities outcome

● **Students:**

- thesis & Project works
- job opportunities
- stage (Internship)

● **Partners:**

- project Development
- joint research collaboration
- students exchange programs

● **Local communities:**

- project writing
- fundraising advisory
- scientific tourism increase

## FIELD STUDY ABROAD

*Travel, Learn, Research and Work in developing communities*



## XV EDITION PROGRAM

**U.S.A & Central America (Honduras - Guatemala - Costa Rica)**

**from 7<sup>th</sup> August 2019 to 5<sup>th</sup> September 2019**

### AUGUST

- 7 Arrival in New York
- 8 Columbia University morning visit – flight to Honduras in the afternoon
- 9 Transfer from San Pedro to La Ceiba - **Honduras**
- 10 Transfer to Quinito, Caribbean village
- 11 **Field work Quinito - Hydroelectric mini-grid**
- 12 Field work Quinito - hydroelectric mini-grid
- 13 Transfer to Copan Ruinas, Mayan archeological site
- 14 Morning visit to Maya Ruins, afternoon arrival in Chiquimula - **Guatemala**
- 15 Field work Chiquimula, Solar irrigation systems for coffee farmers
- 16 Field work Chiquimula, University San Carlos renewable projects
- 17 Transfer to Tegucigalpa - **Honduras**
- 18 **Morning lecture and Transfer to El Diptamo, Olancho**
- 19 Field work El Diptamo Hydro mini-grid
- 20 Field work El Diptamo Hydro mini-grid community (impact evaluation)
- 21 Transfer to Tegucigalpa
- 22 Meeting with UNDP Climate Change Unit
- 23 Meeting with RETE NGO/Ministry of Environment
- 24 Transfer to Guanacaste district - **Costa Rica**
- 25 **Sports and leisure time on the Pacific Coast, San Blas - Guanacaste**
- 26 Visit to Guanacaste
- 27 Meeting with Women Rights' House - Heredia
- 28 Workshop with Women Rights' House - Heredia
- 29 Transfer to CoopeSantos
- 30 Workshop in CoopeSantos MW Wind plant project
- 31 Lectures and working groups in San Josè, visit to Crystal Green Hotel

### SEPTEMBER

- 1 **Leisure time – national parks and seaside in Jaco**
- 2 Visit to Enel Green Power - Chucas 50 MW Hydro Power Station
- 3 Flight San Jose – Boston
- 4 Morning visit and meeting in MIT - afternoon flight back to Italy/original destination

### 3.8 Central America Projects software

I. Homer

Software for microgrid and distributed generation power system design and optimization.  
<https://www.homerenergy.com/>



II. WaSp

The waSp software suite is the industry-standard for wind resource assessment, siting and energy yield calculation for wind turbines and wind farms.



III. I-tree

Software suite from the United State Forest Service (USDA) that provides urban and rural forestry analysis and benefits assessment.



## 4. Costs and benefits

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### 4.1 Budget and Participant Selection

The non-profit organization "Tecnologie Solidali Onlus" in order to make possible the visit and improvement of its (and other) Rural Projects search for FSA participants:

1. Every interested person is encouraged to candidate itself
2. To submit a candidature send an email to [info@fieldstudyabroad.org](mailto:info@fieldstudyabroad.org) with name and motivation letter.
3. The selection of participants is based on CV, motivation, and of course each donor can endorse a trusted witness.
4. Every candidate is invited to stimulate the donations in crowdfunding by individuals and companies to be endorsed and then nominated "Volunteer and Witness of Rural Projects".
5. Upon a donation of 3.000 € to Tecnologie Solidaa a new Candidate Participant is selected from the list as "Volunteer and Witness of Rural Projects", and it is invited to participate the FSA.
6. **All in-country costs, including food, transportation, accommodation, field visits and meetings will be covered by Tecnologie Solidali ONLUS.**
7. Alcoholic drinks, extras, amenities, and international flights are excluded.
8. **Every participant at the end of the FSA will be invited to become mentors for following editions participants, with a 400 € compensation as incentive.**

### 4.2 Accommodation in Central America

Working in the field of humanitarian development requires respect and adaptation to communities lifestyle and culture. Participants and teachers will be hosted together in adequate structures according to the availability on site. Keep in mind that in poor areas sometimes hot water can be a deluxe...

### 4.3 Guidelines to participants about health and safety

Before departure the students are taught during approximately one hour by Mrs. Filomena Pietrantonio, doctor, Director of Department at the hospital S.Eugenio of Rome, 10 years of experience as a teacher in

the Master, an expert in tropical diseases, former chairman of "Medicine San Frontier" Italy, available 24/7 in case of emergency, speaks English, French and Italian.

Upon arrival a first orientation is dedicated to health and safety, however, they are always available a series of slides that information concerning water, food, basic medicines and personal counseling, if required.

- A certificate of health insurance and vaccines performed will be required of all students before departure.

#### 4.4 About outfit and useful things

##### ● Outfit

The weather is warm and humid, therefore it recommends to bring light suits, but it could be opportune to bring:

- a K-WAY;
- a sweatshirt or a jacket;
- boots or sneakers for the fieldwork;
- nice dress for institutional meeting
- any long sleeve light t-shirt is suggested (no withe long sleeve t shirts are admitted)
- long sleeve polo or shirts are encouraged

##### ● Helpful accessories

- hard plastic kitchen utensils;
- bag bed sheet;
- wet wipes for personal hygiene;
- washing soap for clothes;
- universal World Wide Travel Charger Adapter US / UK / EU / AU plug to charge mobile or pc.

## 5. Contacts

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### ● FSA Staff

[info@fieldstudyabroad.org](mailto:info@fieldstudyabroad.org)

### ● On site Team

#### **Andrea Micangeli**

FSA Founder – Adj Professor at SUNY and University of Rome Sapienza

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## ● Remote Support

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Desk support

**Antonio Bisceglia**  
Project assistant

**Chiara Capasso**  
Admin & Comms

## ● Websites



[www.tecnologiesolidali.org](http://www.tecnologiesolidali.org)



[www.cirps.it](http://www.cirps.it)



[www.meridianaenergy.com](http://www.meridianaenergy.com)



[www.fieldstudyabroad.org](http://www.fieldstudyabroad.org)



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