

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

# FIELD STUDY ABROAD

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



**X FSA EDITION IS IN EAST AFRICA (UGANDA-RWANDA-KENYA)**  
*from 27<sup>th</sup> December 2017 to 26<sup>th</sup> January 2018*



*“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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## 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.

Field Study Abroad places students within an international project management in the field of renewable energies and sustainable development, 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 9 editions, mainly in Central and Latin America, counting on more than 150 participants.

Field Study Abroad – 10° edition will take place in **East Africa (Uganda, Rwanda, Kenya) from 27<sup>th</sup> December 2017 to 27<sup>th</sup> January 2018.**

## **Admission requirements and course duration**

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- **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 in East Africa** meeting local Universities, public and private sector entities working in sustainable development, and United Nations agencies
- **1 month International Stage (Internship)**, optional additional period of work experience with one of the partner institutions. The stage (also known as an internship) is for individual students, but in some cases a small group of two to three students is allowed. The request for the internship must be submitted at least two months before departure, or may be made on own travel expenses after the course. For this experience, it is required the students have an acceptable English level.

## Topics

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- 1) **Renewable energies:** wind turbines, photovoltaic systems, hydroelectric power generation, waste to energy systems, smart grids, urban and rural electrification. The main discussed topic is renewable energy generation and its applications; students can develop their thesis or project work directly on the field; the biggest challenge in East Africa is the production and distribution of electricity therefore the activities will be made on the purpose of finding appropriate solutions to identified problems.
- 2) **Project management tools:** Logical Framework Analysis, stakeholder analysis, environmental impact assessment, project monitoring and evaluation.
- 3) **Financial evaluation:** international funds for development, public-private partnerships, business planning, fundraising and management.
- 4) **Feasibility study:** field survey methods, data collection, desktop analysis, need assessment, cross-cutting issues.
- 5) **"learning by doing" approach:** 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.

## University contact and partner institutions

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- **University Students and Teachers in the past editions:**
  1. University "Sapienza" of Rome
  2. University of Perugia

3. University of Pisa
4. Hawaii Pacific University
5. Columbia University in New York
6. United Nations University for Peace
7. State University of New York
8. Berkeley University (CA)
9. University of Cambridge (UK)
10. Washington University (Seattle US)

• **Partner institutions in next FSA X:**

1. ENEL Green Power – Main power utility company in the world, Latin America and Kenya
2. KPLC – Kenya Power and Lighting Company, Kenya
3. MAKERERE UNIVERSITY – Photovoltaic testing laboratory and Engineering Faculty
4. ABSOLUTE ENERGY AFRICA – Rural electrification utility company, Uganda and Rwanda
5. Micro Grid Academy - Community in East Africa for Carbon Free project, Kenya
6. UNEP - United Nations Environment Programme, Kenya
7. AVSI NGO - Non Governmental Organization for human development, Uganda, Rwanda and Kenya
8. ESKOM UGANDA – Private hydropower operator
9. KAKIRA SUGAR – Sugar production and biomass generation player, Uganda

## **Course Mode – Students & Teachers**

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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.

## **Program**

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

<b>60h Frontal lessons</b>	<b>C</b>
<b>28h Exercises</b>	<b>E</b>
<b>31h Field visits</b>	<b>FV</b>

## 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) 6 C & E
- LFA III (Sources and Matrix) 6 C & 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 C, FV, 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 12 C & 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
- Efficiency in Renewable and Fossil Energy Sources 4 C & FV
- How to write a Business Plan 3 C

#### Environmental Conservation: 12 h

- Projects against Climate Change and Natural Resources Conservation 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
- Energy Project in Conflicts 4 C & FV

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

- How to stay in the Field managing Safety, Security, Stress, Health, and Cooperation 3 FW
- Mini Hydro Merhu, Kenya 25FW
- Rutenderi Solar Mini Grid and Water Supply, Rwanda 25FW
- Kitobo Hybrid PV system, Uganda 25 FW

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## Students, partner organizations and local communities outcome

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**Students:**

- Thesis & Project works
- Job opportunities
- Vocational Training
- Stage (Internship)

• **Partners:**



- Project Development
  - Joint research collaboration
  - Students exchange programs
  - Renewable resources mapping
- **Local communities:**
    - Data Collection
    - Project writing
    - Fundraising advisory
    - Scientific tourism increase

## Costs and tips

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### Costs and expenses on site

The Field Study Abroad is organized by CIRPS (Interuniversity Research Centre for Sustainable Development), TECNOLOGIE SOLIDALI a no-profit organization and Meridiana Energy Srls as technical partner.

The cost of the program is divided into:





- € 3.000 to be donated to the non-profit organization "TECNOLOGIE SOLIDALI", for Rural Project Development and all required in-country costs, including meetings, field visits, local transportation, lodging, and food for all FSA days. The student will need to cover their visa, souvenirs, additional drinks and food beyond what is provided during meals, and other personal expenditures;
- the approximate cost of the students for incidentals (i.e., border taxes, visas, extra food, extra sports and cultural visit, etc.) typically does not exceed € 300;
- flight ticket is excluded.
- Health insurance is excluded.

Local partner organizations may offer scholarships to selected students in their internship collaboration.

### Accommodation and H&S in East Africa

Participants and teacher will be hosted in adequate structures according to the availability on site. In rural areas sometimes hot water is a luxury...

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.

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 "Doctors without borders" Italy, available 24/7 in case of emergency, English, French and Italian speaker.

Students are required to submit requested medical information prior to their arrival in East Africa, to ensure that in the event of medical problems, they can be treated while participating in the program both in terms of physical health and mental.

A health insurance certificate will be required from each participant before departure.

**Working in the field of humanitarian development requires respect and adaptation communities lifestyle and culture.**

## Contacts

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