

EAS 312: Engineering for the Developing World

College of Engineering & Applied Sciences
TBI Global Engineering Summer Field School
Ileret, Kenya, Summer, 2017



Instructor Information

Faculty: Rodrigo Pena-Lang
Email: rodrigopenalang@gmail.com

Course Description

This class introduces students to the main principles of engineering and discusses the details of providing a standard of living that is adequate for human settlement in developing countries. The discussion will be based on the social, geo-political, and infrastructural elements in Ileret, Kenya. Students will be exposed to a comparison between the resources available in developed countries against those available in rural areas and/or areas of limited resources. More specifically, students will be exposed to the obstacles encountered during the engineering process of developing means for infrastructure, water availability, and other essential components for sustainable human inhabiting. This experience will be enhanced by witnessing firsthand the conditions of the limited-resource environment in Ileret, Kenya.

Prerequisite: EAS 310, permission of the instructor

SBC: STAS, Partially fulfills: EXP+ and ESI (with EAS 310)

Course Purpose

The various disciplines of engineering engaged in infrastructure development will be studied aiming for the understanding of the basic principles of providing an environment adequate for human settlement. This class will target for an evaluation of the available natural resources throughout the region near Ileret and an assessment as to how these resources could be used to supply the human demand for development and economic independence. This evaluation will include an analysis of the existing conditions regarding the following technical areas:

- Construction technology
- Means of transportation
- Contamination
- Hygiene and sanitation
- Water resources
- Water quality and water quantity
- Soil and land characteristics; topography

The technical aspect of each subject matter will be assessed with elements of social and geopolitical nature. Empowering people of lower economic status is the most challenging aspect of working in third world nations. This class will be guided towards the learning experience from the local population; working within the boundaries of their social, environmental and economical limitations. The practice of engineering is bounded to work at socially responsible level to avoid failing attempts.

Along with the theoretical frame given through lectures, a field investigation will be guided to help defining the unique characteristics of the area near Ileret. During the site visits, students will observe the surroundings and will be expected to utilize the theoretical knowledge acquired in lectures to evaluate the living conditions of the people inhabiting in this area. After the site visits, students will be required to identify problems in the area. The final project will include working in one chosen challenging problem, a proposed solution for such problem, and an oral presentation of this solution.

[Type here]

Experiment and testing of some of the resources/construction material found in the area will be available through lab analysis. The experiments performed during this class will be determined depending on site investigation and group interest.

Course Learning Outcomes (CLO)

Upon completion of this course, students will be able to:

- CLO 1. Demonstrate knowledge and understanding of the society, culture, and technological needs and challenges of sub-Saharan Africa villages
- CLO 2. Understanding of the basic principles of providing an environment adequate for human settlement.
- CLO 3. Identify a technological need of an unfamiliar society. Research and propose a solution that fits within the boundaries of social, environmental and economical limitations.
- CLO 4. Understand how and why Western solutions may or may not work for other cultures and environments.
- CLO 5. Work in multidisciplinary teams

Course Topics

- 1) Introduction to Infrastructure/Local Community
- 2) Construction Engineering/Sustainability/Economics
- 3) Environmental Engineering/ Geopolitical and Social Elements
- 4) Development of Product Design Specifications
- 5) Analysis/Design Fundamentals
- 6) Final Project and Written Report

Class Meetings: Monday - Saturday, 9:00 am - 12:00 pm, and 2:30 - 5:30 pm (when not on field)

Note: for Contact Hour calculation 'Lab' is considered as requiring outside preparation time and given a 2/1 ratio, while 'Field' is considered as not requiring outside preparation time and given a 3/1 ratio.

Week	Day	Lecture	Lab	Field	Other	Total
1	1	6				8
1	2			6		8
1	3		4.5			8
1	4	6				8
1	5			6		3
1	6	6				8
2	7		4.5	6		8
2	8					8
2	9	6				8
2	10			6		8
2	11		5			
2	12	6				
Total Hours		30	14	24		68
Contact Hours		30	7	8		45

[Type here]

Textbook

No textbook is required, however, reading would be assigned by the instructor through the blackboard site.

References:

Kevin Passino, Humanitarian Engineering (2016), Advancing Technology for Sustainable Development, 3rd Edition. (free download on-line)

Penn, M. and P. Parker, Introduction to Infrastructure (2012), John Wiley & Sons, Inc., New York [ISBN978-0-470-41191-9].

Grading

Grading Distribution

A	95-100	B	80-84	D+	65-69
A-	90-94	C+	75-79	D	60-64
B+	85-89	C	70-74	F	0-59

The following is the breakdown:

- 1) In-class work and discussions 20% -- students are expected to actively participate in the class discussions, field interviews and data collection. There will be several group and individual in-class activities that will be collected and graded.
- 2) Lab exercises 20% — lab or practical assignments must be completed and handed in as instructed.
- 3) Oral Presentations 20% — students are expected to expose their final report in an oral presentation on the last day of class.
- 4) Final Report 40 %

Daily Outline

- **Day 1**
 - Morning Session (9:00 am to 12:00 pm): Introduction to Infrastructure, Natural Environment, Structural Infrastructure, Energy
 - Lunch Break (12:00 pm to 1:00 pm)
 - Afternoon Session (1:00 pm to 4:00 pm): Engineering Ethics, Why Projects Fail in Third World Nations, Cultural Enrichment and the Local Community
- **Day 2 – Site visit (details TBA)**
- **Day 3 – Lab work (details TBA)**
- **Day 4**
 - Morning Session (9:00 am to 12:00 pm): Construction Engineering, Roads, Mass Transit, and Non-Motorized Transportation
 - Lunch Break (12:00 pm to 1:00 pm)
 - Afternoon Session (1:00 pm to 4:00 pm): Sustainability (Available resources in Ileret, Analysis of resource exhaustion, Renewable alternatives), Economics (Capital cost, Maintenance cost, Long term funding)
- **Day 5 – Site visit (details TBA)**
- **Day 6**

[Type here]

- Morning Session (9:00 am to 12:00 pm): Environmental Infrastructure, Drinking Water and Wastewater Infrastructure, Stormwater Infrastructure
- Lunch Break (12:00 pm to 1:00 pm)
- Afternoon Session (1:00 pm to 4:00 pm): Social and Geopolitical Aspects (Market analysis, Business evaluation, Public participation/opinion, Education and training), Policy Adjustments
- **Day 7 – Site visit (details TBA)**
- **Day 8 – Lab work (details TBA)**
- **Day 9**
 - Morning Session (9:00 am to 12:00 pm): Analysis Process (Identifying the problem, Identifying the root of the problem)
 - Lunch Break (12:00 pm to 1:00 pm)
 - Afternoon Session (1:00 pm to 4:00 pm): Design Process and Applications
- **Day 10 – Site visit (details TBA)**
- **Day 11 – Lab work (details TBA)**
- **Day 12**
 - Morning Session (9:00 am to 12:00 pm): Class Interaction (Assistance in development solutions)
 - Lunch Break (12:00 pm to 1:00 pm)
 - Afternoon Session (1:00 pm to 4:00 pm): Final Presentations

Communication

You must have an active Stony Brook University e-mail account and access to the Internet. All instructor correspondence will be sent to your SBU e-mail account. Please plan on checking your SBU email account regularly for course related messages. To log in to Stony Brook Google Mail, go to <http://www.stonybrook.edu/mycloud> and sign in with your NetID and password.

This course uses Bb for the facilitation of communications between faculty and students, submission of assignments, and posting of grades. The Bb Course Site can be accessed at <https://blackboard.stonybrook.edu>

Academic Policies

Academic Integrity Statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at <http://www.stonybrook.edu/uaa/academicjudiciary/>

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn.

[Type here]

University Student Conduct Code can be found at (check for most current version)
<http://studentaffairs.stonybrook.edu/ucs/docs/universitystudentconductcode.pdf>

ADA & Disability Support Services (DSS) Statement: The Rehabilitation Act of 1973 – Section 504 applies to all postsecondary educational programs that receive federal assistance. Reasonable accommodations and academic assistance are provided to students with disabilities registered with the Disability Support Services, ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential. For procedures and information go to the following website: <http://www.stonybrook.edu/ehs/fire/disabilities>

Course Materials and Copyright Statement: Course material accessed from Bb, SB Connect, SB Capture or a Stony Brook Course website is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity and Student Conduct Codes.

Syllabus Disclaimer

The instructor views the course syllabus as an educational understanding between the instructor and students. Every effort will be made to avoid changing the course schedule but the possibility exists that unforeseen events will make syllabus changes necessary. The instructor reserves the right to make changes to the syllabus as deemed necessary. Students will be notified in a timely manner of any syllabus changes via email or in the course site Announcements. Please remember to check your SBU email and the course site Announcements often.