Ingenieros Sin Fronteras (ISF) Summer School

Universidad de los Andes

**Humanitarian Feedback Control Engineering**

Part of ISF program by Catalina Ramirez, Universidad de los Andes

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**Preparation:**

*Download:* You need to do the following downloads as the last time these were updated was June 29, 2015, with changes to the book and code relevant to this course.

1. Download: Kevin M. Passino, *Humanitarian Engineering: Creating Technologies That Help People*, Edition 2, Bede Pub., Columbus, OH, 2015 (<https://hebook.engineering.osu.edu/book>)
2. Download: HEcode.zip (Matlab/Simulink code for all simulations covered, and for homework problems) from the above web site.

*Matlab:* Make sure that you have access to, and can run, both Matlab and Simulink as they will be needed for the assignments below to run the code from HEcode.zip

*Read:* First three sections of the Preface of the book (5 pages), this document, and the Final Project description, including the IEEE Humanitarian Challenge document. All these are given at the short course web site below.

**Tuesday, June 30:**

9-12:00 World poverty and development, sustainable development

Feedback control for a personal financial advisor

14:30-17:00 Modeling and analysis of sustainability (tragedy of the commons)

Distributed feedback control for wealth distribution

Distributed optimization model of democracy

**Homework 1:** Problems 1.38, 1.39, 2.37, and 2.39 (from [1]).

**Due:** Wed. July 1, 9am (email solution to [passino.1@osu.edu](mailto:passino.1@osu.edu) and [nquijano@uniandes.edu.co](mailto:nquijano@uniandes.edu.co)).

**Final Project:** Form teams per guidelines

**Wednesday, July 1:**

9-12:00 Analysis of environmental justice and the commons

Nonlinear models, poverty traps, equilibria, stability

Sensitivity analysis and optimization for economic models

14:30-17:00 Technology diffusion, impact on development, breaking poverty traps

Resource utilization control for sustainability

Multicriteria decision making, sensitivity/robustness, applications to

humanitarian project and technology selection

**Homework 2:** 2.41, 3.38, 3.41, 3.42

**Due:** Thurs. July 2, 9am (email solution to [passino.1@osu.edu](mailto:passino.1@osu.edu) and [nquijano@uniandes.edu.co](mailto:nquijano@uniandes.edu.co)).

**Final Project:** Pick project from set of options

**Thursday, July 2:**

9-12:00 Multicriteria decision making, sensitivity/robustness (continued),

Cooperative management of community technology

14:30-17:00 Dynamics and analysis of technologies in sustainable community

development. The 10 Principles of Humanitarian Engineering

**Homework 3:** 4.60, 4.78, 4.80

**Due:** Fri. July 3, 9am (email solution to [passino.1@osu.edu](mailto:passino.1@osu.edu) and [nquijano@uniandes.edu.co](mailto:nquijano@uniandes.edu.co)).

**Final Project:** Formulate and ask any questions about your project

**Friday, July 3:**

**Final Project:** Humanitarian Challenges for Colombia (see document at web site below)

Supervised final project work on teams. Students should, in class, working in groups, begin to solve their final project. For instance, research on a number of aspects of the project can be done over the internet. Or, the group may want to poll the class to find out what they think about a particular topic.

**Due Date:** July 6, noon, Bogotá time.

**Grading:**

* Homework 1: 15%
* Homework 2: 15%
* Homework 3: 10%
* Final Project: 60%

Late policy: Any assignment that is submitted late is deducted 15% of the total grade per day it is late.

**Short Course Web Site:**

The web site for this short course is: <https://hecourse.engineering.osu.edu/short-courses>

Here, the following are posted or will be posted:

* Schedule and assignments
* Final project
* Slides (ppt) for all lectures
* Lecture videos (after completion of course)

[1] Kevin M. Passino, *Humanitarian Engineering: Creating Technologies That Help People*, Edition 2, Bede Pub., Columbus, OH, 2015. Click [here](https://hebook.engineering.osu.edu).