

## **Request for Proposals on Educational Modules for Sustainable Manufacturing**

Recently, the NSF has funded a project titled: Sustainable Manufacturing Advances in Research and Technology (SMART) Coordination Network. The funding has been provided through the NSF Research Coordination Networks-Science, Engineering and Education for Sustainability (RCNSEES) track. A primary objective of the project is to bridge the gap between the academic knowledge discovery and industrial technology innovation for sustainable manufacturing. Various research, educational, and outreach activities are underway. In the area of education, the project aims to generate a number of case-study educational modules for sustainable engineering education that should be widely adoptable for undergraduate/graduate education and professional training in industries. Several modules have been developed and are available for download and review from <http://cache.org/super-store>.

New proposals are solicited from educators to develop modules on sustainable manufacturing case studies (SMCSs). Suggested areas of interest for these modules are sustainable process design, operation, control, process intensification, supply chain management, resource and energy conservation, nanomaterials, nano-enabled product design and manufacturing, batteries, advanced sensors for control, 3D printing, and molecular modeling. An SMCS comprises both an interactive, graphically-oriented case study with supporting materials (e.g., data, models, simulations) that help the instructor and the student learn about some aspect of sustainable manufacturing design. A typical SMCS will have the following structure:

- Introduction and Background in a text document (template will be provided), describing the physical system represented by the case study and its importance. This includes basic concepts such as the relevant properties that appear as inputs or outputs of the manufacturing system.
- Engineering Principles and Models, providing a thorough overview of the fundamental principles and engineering models that exist, which may be applied to describe the process trade-offs.
- Problems in a text document, relevant to the case study and suitable for an instructor to assign as homework activities, focused on the connection between the sustainability and the manufacturing process.
- Design activity, which exposes the student to the use of an engineering model in a design setting. The activity would have the student use the model to develop a design related to the targeted systems and which meets sustainability metrics.
- Presentation slides for in-class instruction or self-study covering the principles, models, and case studies explained in a graphical manner.

The SMCSs will be disseminated to the academic community and will be published using CACHE (Computer Aids in Chemical Engineering) resources (e.g., <http://cache.org>).

It is expected that four SMCSs will be developed annually. An honorarium of \$4,000 will be provided to the developer(s) of each SMCS.

Interested educators should **email the proposals (in pdf format)** to [El-Halwagi@tamu.edu](mailto:El-Halwagi@tamu.edu) and [debalinasengupta@tamu.edu](mailto:debalinasengupta@tamu.edu) with the title "SMCS module - <instructor/institution name>". The proposal length should be limited to **three pages** and should include the following:

- Proposal title, list of developers, affiliation, and contact information
- Introduction: giving a brief background, motivation for the SMCS, and relevance to sustainable manufacturing
- Problem statement: describing the scope of the problem/case study to be addressed
- Approach: highlighting the engineering principles to be used in constructing the SMCS
- Deliverables and timeline: describing format of the SMCS and associated materials
- Assessment plan

The deadline for the proposals is **August 15, 2015**. The templates for the deliverable documents will be provided to selected proposals. Selected proposals are to start on September 1, 2015 and the deliverables are expected by February 1, 2016.

We look forward to hearing from you!

PI: Yinlun Huang (Wayne State University)

Co-PIs: Cliff I. Davidson (Syracuse University), Mario R. Eden (Auburn University),

Thomas F. Edgar (University of Texas), and Mahmoud M. El-Halwagi (Texas A&M University).