4th International CDIO Conference
ACTIVE ENGINEERING EDUCATION
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Title RENEWABLE AND ALTERNATIVE ENERGY COURSES IN AN ENGINEERING PROGRAM

Authors and Affiliations

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Type of Presentation: (check one)

_X___ active paper (15-30 min)
_____ poster session (60 min)
_____ round-table session (60 min)
_____ advanced workshop (45 min)
_____ advanced workshop (90 min)

Short Description: In courses on renewable and alternative energy for engineering students attention should be given to the complexities and full consequences of the solutions adopted. Ways of doing this are discussed. These considerations can also be the basis to illustrate the difficulties engineers almost always face in dealing with complex problems.

Relevance to the Conference Theme, Strands, and/or CDIO Initiative

Please indicate (tick) the strand that the presentation most closely relates to.

	Application of CDIO to a wide range of disciplines		Curriculum and programme design
	The involvement of industry		Technology-enhanced learning
✓	Development of professional competences		Assessment of professional competences
	Design-implement experiences		Facilitating change in engineering education
	Supporting sciences and CDIO		Evaluating the impact of CDIO Programs
	Student involvement		Active and experiential learning

Abstract

Often courses in renewable and alternative energy for engineering students are mainly concerned with details of how different energy sources and systems are used and with the direct consequences of this use. Such courses can however be used as the basis of teaching students about some of the factors that enter into finding solutions to complex engineering problems in general. For example, in the teaching of renewable and

alternative energy to engineering students it is important to stress that an engineer must always consider all sides of the problem at hand and must understand that, in arriving at a solution, some trade-offs between different requirements and constraints will more often than not be necessary, i.e., that there is often not a single truly "best" solution to an engineering problem. An understanding of this can be of great importance in dealing with energy related problems and can also be important in developing in student an understanding of the complexities that can arise in dealing with other complex real-world engineering problems. In reviewing the present energy situation it is important to consider the factors that have led to this situation. It is necessary to remember these factors in searching for means of meeting future energy needs. It is necessary to remember that the obvious wood that surrounds us was first used as an energy source but that with time people learnt to look beneath the surface for other sources. It is necessary therefore to accept that the most obvious solution is not always the best solution. In courses on energy an effort should be made to encourage students to innovatively consider new approaches to supplying energy needs. There are a number of interrelated problems facing the world today, such as global warming, shortages of water, limited supplies of fossil fuels, deforestation, shortages of food, over-population, etc, and in seeking a solution to one of these problems care must be taken to ensure that the solution adopted doesn't exacerbate one of the other problems. This is of course related to the engineer's ethical commitment to finding solutions that are of the greatest overall benefit to the engineer's fellow humans. The problem is that the solution that is best for one group may do harm to another group and that the consequences the solution will have for all groups must be taken into account. In teaching energy related courses more discussion of lifecycle approach for use in the evaluation of energy systems should be given. This should include discussion of costs and short and long term environmental effects. Also, because of its relevance to solving our energy problems, it is important to deal with the interaction of engineering and society in courses on energy.

Active presentation techniques

Describe one or two ways in which you intend to engage the audience (for example, paired discussion, personal response using clickers or flash cards …). This section is a decisive factor in the acceptance of your proposal and the amount of time you will be allocated.

Active presentation technique(s) to be used: The only real interactive aspect of the presentation will be an attempt to involve the audience in the discussion of how best to produce broad student learning in this area.

Facilities/equipment required (tick all those appropriate)

- ✓ Computer projector (provided in all locations)
- Overhead projector
- Flip charts and pens
- Clickers (personal response system)
- Coloured flash cards
- Post-it notes
- Other (please describe)

Send all proposals via e-mail as MS Word or pdf files to **jgaywood@liv.ac.uk** **on or before December 7th 2007**