Department of Computer Science
Department of Electronic Systems Engineering

Outline degree scheme structure

Theme:	*Alternative Energy Systems*

A degree in alternative energy systems at the University of Essex represents a unique career opportunity in the emerging micro-generation industry. Wind turbines, solar heaters and solar panels are becoming very cheap and subject to government subsidies. With commitments to 20% renewable in five years agreed in Europe this represents the next 'double glazing' revolution, but with a need for high calibre engineers. The course will teach you about the motivation, technology, supply and implementation behind renewable systems and you will make valued judgements at all of these stages. Graduates from the scheme will have expertise in weather systems, renewable generation, electronics and computing. An unprecedented combination of: physics chemistry, maths, biology, electronics, politics and psychology offer many options within the scheme which will guide the choice of career.

A first year equips you in:

- *Carbon footprint estimation and modelling*
- *Fundamentals in electronics*
- *Identifying that which is renewable*
- *Renewable energy farm design*
- *Solar electricity and heating*
- *Field evaluation of the renewable potential*
- *Writing computer programs*
- *Generators and their control*
- *The ecology and the environment*
- *Signal processing and control systems*
- *The politics of renewables; changing a generation*
- *Intelligent buildings*
- *Publicity and how to design web pages*
- *The chemistry of the eco system*
- *Professional development of an environmental engineer*
- *Finance: supply, demand and breakeven*

Project work encompasses the above and includes the design of a computer controlled wind solar combination.

A second year prepares you for:

- *The national grid and tie inverters*
- *Installation of renewables, the health and safety implications*
- *Electronic devices, the physics behind photovoltaics*
- *Digital systems*
- *Understanding the weather and the renewable implications*

- *Thermodynamics of buildings*
- *Graphical modelling of customer requirements*
- *Control and implementation of hybrid renewables*
- *Funding procurement and budget management*
- *Sensor network design*
- *Intelligent houses using the x25 protocol*
- *Aerodynamic principles*
- *Professional development for the environmental engineer*
- *DSP architectures and software*
- *RF and modulation principles*
- *Turbine, hydro, wave, geothermal, biofuels, thermo collectors and heat pumps*

A third year develops expertise in:

- *The all important final project involving design building testing and research study*
- *Digital systems*
- *Programming embedded systems*
- *Electronic control of buildings, X10, RF and the controlling software*
- *Weather forecasting, power forecasting and energy budget balancing*
- *Professional development for the environmental engineer*
- *Storage principals, batteries, grid tie and futures*
- *Electric vehicles; design and implementation*
- *FPGA and microcontroller implementations*
- *Networked building control*
- *Control systems theory*
- *Sustainability*
- *Renewable Potential Maps*
- *Becoming a registered installer*
- *Intelligent charging*
- *Changing a generation revisited, where do we go from here?*
- *Carbon footprint calculation of the degree scheme*
- *CAD design*

Year 1 Structure

Module 1 *CE101A* + *CE101B*	*C programming, Autumn Term* ---------- *Matlab*	*Shared with all other degrees except C+M.* ---------- *Shared with E+T*	*The second part of this module for CS and CN students is OO programming with Java taught in the Spring Term. The second part must be in the Spring Term. AES students may be able to opt for Java if they wish*
CE10X (coursework + Biological Sciences) *Current Environmental concerns and the* potential of renewables	Chemistry and the environment Wind speed and insolation data gathering and collation. Carbon footprint calculations	*Taught in conjunction with biological sciences. 'Potential for renewable sources' is coursework but with preparatory lectures and tutorials*	*Awareness of anthropologic impacts on the environment. Just in Time chemistry. Predict annual energy budget for a variety of scenarios based on current latitude. Math skills required.*
Module 3	*Professional development and electronics lab work and skills*	*Shared across all CES disciplines*	*Module with common professional part but three versions of the second part (skills) with particular emphasis on presentations about the environment*
Module 4 *Electronics*	*Foundations of electronics, signals and systems.*	*Overlap with E+T*	*Requires mathematics entry qualifications.*

Mathematics skills required. 10-credits of specialised study in CE10X. These would be taught in small groups, tutorial style, and examined by coursework or a mini-dissertation. This provides an element of choice for the student without having formal optional modules.

Year 2 Structure

The general idea here is to have two core modules per degree theme, plus two more specialised modules per degree, but with some sharing of the core modules between degrees.

Core module 1 *Signal processing*	*Continuous and discrete time signals and systems.* *Modulation.* *DSP architectures and software.*	*Overlap with E+T*	*maths and programming skills*
Core module 2 *Devices and electromagnetics*	*Semiconductor devices.* *Electromagnetics inc EMC.* *RF techniques.*	*Overlap with E+T*	*Hardcore maths content such as calculus, vectors.*
Specialised module 1 *Renewable sources and interventional conservation*	*Energy conversion, storage, electronic power control management, balancing demand in an opportunistic environment. The intelligent wired house*	*Overlap with other modules is unlikely*	*Maths and electronic skills and some telecommunications* *To include about 10 credits of specialised study taught by tutorial selected from a list of topics available each year. **
Specialised module 2 *Renewable energy sources*	*Wind turbine design and aerodynamic principles. Hydro, wave, geothermal, biofuels, thermal collectors and heat pump principles*	*Overlap with other modules is unlikely*	*Principles reinforced by static and computer modelling, to include about 10 credits of specialised study taught by tutorial selected from a list of topics available each year. **

Year 3 Structure

This can be much more tentative than the structure for year 2. We may even consider 15-credit modules, if necessary.

Core module 1 Individual project	Final year project involving individual design/build/test or research study.	Included in all degree schemes.	*e.g. controlling software for building management*
Core module 2 *Signals and systems*	*Filter design using CAD. Implementation. MIMO systems. Classic DSP algorithms.*	*Shared with E+T*	*To include about 10 credits of specialised study taught by tutorial selected from a list of topics available each year. **
Specialised module 1 *Digital systems and embedded computers.*	*Digital systems design and embedded processor systems. FPGAs.* *Design and test mini-project.*	*shared with E+T.*	*EE degree only.*
Specialised module 2 *Intelligent buildings and sensor networks*	*Energy efficiency in modern buildings. Electronic control and management of buildings including X10, RF and controlling software*	*Overlap with other modules is unlikely*	*To include about 10 credits of specialised study taught by tutorial selected from a list of topics available each year. **
Specialised module 3 *Transportation control systems*	*Wheeled vehicles, motors, gearboxes and control gear. Batteries and characteristics*	*Overlap with other modules is unlikely*	*To include about 10 credits of specialised study taught by tutorial selected from a list of topics available each year. **

* The idea of 10-credits of specialised study is similar to the idea of directed-study modules at PG level. These would be taught in small groups, tutorial style, and examined by coursework or a mini-dissertation. This provides an element of choice for the student without having formal optional modules.