

Summer School

Renewable Energy Courses

- **RE1: Organic and Dye Based Photovoltaics**
- **RE2: Optimization of Bioenergy Use**
- **RE3: Biogas Technology for Sustainable Second Generation Biofuel Production**

RE1: Organic and Dye Based Photovoltaics

International School on Organic Photovoltaics (ISOPHOS)

Time: August 8 – 12, 2011

Place: Ag Gamma

Credits: 2 ECTS

Lectures: 20 h lectures

Course coordinator: Prof. Jouko Korppi-Tommola

Lecturers: Dr. Gerrit Boschloo (University of Uppsala), Dr. Florian Schiffmann (University College London), Prof. Jouko Korppi-Tommola (University of Jyväskylä), Dr. Janne Halme (Aalto University), Dr. Moritz Riede (University of Dresden), Dr. Thomas Kirchartz (Imperial College), Dr. Roderick Mackenzie (Imperial College London), Prof. Ronald Österbacka (Åbo Akademi), Prof. Tonu Pullerits

Programme: [here](#)

Prerequisites: M.Sc. in chemistry or physics, recent review articles on polymer and dye solar cells (Chem.Rev., 2010,110,6595-6663)

Passing: Obligatory attendance at lectures + practical problems or essay

Grading: Pass/fail

Abstract: Teaching focuses on fundamental principles of polymer based and dye sensitized solar cells and recent advances in science and technology in both fields. Both of these 3rd generation technologies approach the magic 10% efficiency mark and have promise to become competitive mass products in the silicon governed PV market. Besides 20 hours of lectures obtaining the credits includes solving practical problems and writing an essay on a topic given. The course is suited to late phase Master students, Ph.D. students as well as PhD's and researchers from chemistry, physics and engineering.

The course is run in co-operation with the International Summer School ISOPHOS (Center for Hybrid and Organic Solar Energy, University of Rome Tor Vergata) and Åbo Akademi University and it is sponsored by a research consortium 'Low cost PV' under the research program Photonics and Modern Imaging funded by the Academy of Finland.



RE2: Optimization of Bioenergy Use

Time: August 15 - 19, 2011

Place: KEM1

Lectures: 21 h

Credits: 4 ECTS

Coordinator: Prof. Jukka Konttinen

Lecturers: Prof. Jukka Konttinen (University of Jyväskylä), Prof. Esa Vakkilainen (Lappeenranta University of Technology), Prof. Martti Larmi (Aalto University), Ilkka Savolainen (VTT Technical Research Centre of Finland), Mikko Hupa (Åbo Akademi), Riitta Keiski (University of Oulu) and Prof. Lauri Sikanen (University of Eastern Finland)

Programme: [here](#)

Prerequisites: M. Sc. level skills in the field of energy are required.

Passing: Obligatory attendance at lectures + study memorandum (opintopäiväkirja) and a special homework (harjoitustyö).

Grading: Grading scale of 0 to 5

Abstract: The objective of the course is to give an overview of current bioenergy use and how to optimize future utilization. State-of-the-art technology in bioenergy will be reviewed, including: current topics of research and development, future aspects, unresolved problems and needs for further research. The lectures will be divided into the following topics: Future of bioenergy, bioenergy production in small scale, torrefaction, biomass combustion in fluidized beds, pellet production and use, gasification with related biorefineries and transport fuels based on biomass. Completing the course includes a study memorandum and a homework exercise.

Company presentation by Vapo Oy on Friday 19.8.

The course is organized in cooperation with the Graduate School for Energy Science and Technology (EST).

RE3: Biogas Technology for Sustainable Second Generation Biofuel Production

Time: August 15 - 19, 2011

Place: Ag Gamma

Lectures: 20 h lectures + 2 h excursion + 2 h exam

Credits: 2 ECTS

Coordinator: Prof. Jukka Rintala (jrintala@cc.jyu.fi)

Lecturers: Prof. Charles Banks and Dr. Andrew Salter (University of Southampton, UK), Michael Chesshire (Biogen Greenfinch), Dr. David Bolzonella (University of Verona, Italy), Dr Cristina Cavinato (University of Venice, Italy), Dr Reinhold Waltenberger (University of Natural Resources and Life Sciences, Vienna, Austria) and Prof. Jukka Rintala (University of Jyväskylä)

Programme: [here](#)

Level: Graduate, undergraduate

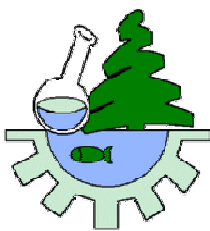
Number of student: 50

Passing: Obligatory attending to lectures and excursion + passing the exam

Grading: pass/fail

Abstract: This course presents the fundamentals and most recent developments in biogas technology for sustainable renewable energy production and nutrient management. Anaerobic microbiology, biochemistry and reactor design are described as well as the application of biogas technology in municipal and industrial waste management and in industrial-scale energy production from agro-wastes and crops. The concept of biogas production from food waste as second generation biofuel source, including the collection, pretreatment and process optimisation is presented as well as its energy and mass balance and carbon foot print for sustainability criteria. The different potential uses of the produced biogas and the digestate are also discussed, including environmental impacts and benefits on greenhouse gas emissions and nutrient recycling.

*The course is organized in cooperation with the Graduate school for Energy Science and Technology (EnSTe) and the Graduate School for Energy Science and Technology (EST) and supported by **EU FP7 VALORGAS project.***



VALORGAS