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SELECTED TEACHING ACTIVITIES

ChE 38 Inorganic Process Principles II

1 Term – 1 Credit Course – Laboratory and Tutorials – University of Waterloo – 2004- current

ChE 38 is concerned with the principles and applications of electrochemistry and electrochemical engineering.

1. Introduction

- basics of electrochemical reactions and processes
- overview of applications
- some basic concepts and conventions
- Faraday's law

2. Transport Phenomena in Electrolytes

- electrolytic conduction
- diffusion, migration and convection

3. Electrode Reactions (Equilibrium)

- reversible electrode potential, Nernst equation
- cell emf
- applications of equilibrium potentials (reference electrodes, specific ion electrodes)

4. Electrode Reactions (Non-Equilibrium)

- electrode kinetics, overpotentials
- transport-controlled electrode reactions
- electrolytic and galvanic cells
- potential distribution across cells
- applications

5. Electrochemical Engineering

- reactor design of electrochemical reactors (CSTR)
- current efficiency of cells

6. Applications

- materials
- corrosion
- batteries, fuel cells

ChE 046 - Engineering Design Workshop

1 Term – 1 Credit Course –with Tutorials – University of Waterloo – 2004- current

This course provides an opportunity to start the 4th year design project, which will be continued in 4B. In this course, project definition, literature searching, and preliminary analysis will occur. Potential solutions will be identified, and a recommended plan of action will be presented at the end of the term, in the form of a full Project Proposal. This course also cover material of use to projects and professional practice including: search strategies for technical information, technical writing and presentations, problem definition and solving strategies, process synthesis, analysis and optimization, process troubleshooting, process hazards analysis, environmental management and safety in design, project management.

Industrial Ecology ChE 565 – To start in 2008

1 Term – 1 Credit Course –with Tutorials – University of Waterloo – 2004- current

Industrial Ecology a rapidly growing field that systematically examines local, regional, and global uses and flows of materials and energy in products, processes, industrial sectors, and economies. It focuses on the potential role of industry in reducing environmental burdens throughout the product life cycle from the extraction of raw materials to the production of goods, to the use of those goods and to the management of the resulting wastes. This course will review the environmental issues associated with chemical industries and the roles of engineers to manage these issues. The course will address concepts such as fate and exposure of chemical. The principals and philosophy of green chemistry will be addressed included pollution prevention in unit operations. The concepts and practices of environmental life cycle analysis and accounting will be addressed in detail. The course will also cover the basics of risk assessment, risk management and risk communication.

Text: David Allan, David Shonnard, Green Engineering – Environmentally Conscious Design of Chemical Processes, Prentice Hall 2002.

ChE 100 ChE101/EnvE101 - Chemical Engineering Concepts I and II

1 Term – 1 Credit Course Each Term – Laboratory and Tutorials – University of Waterloo - 2002

ChE 102 – Chemistry for Engineers

1 Term – 1 Credit Course – University of Waterloo - 2002

ChE 750 - Special Topics in Electrochemistry - Fuel Cell Technology

1 Term – 1 Credit Graduate Course – University of Waterloo - 2002

EnvE 334 – Environmental Chemistry

1 Term – 1 Credit Course – University of Waterloo – 2002 - 2006

To provide a basic understanding of how chemistry applies to environmental engineering and the chemistry of the major environmental issues of the day. This course examines the relationship between chemistry and the environment from a chemical/environmental engineering point of view.

CCE 289 - Environmental Sciences: Impact of Science and Technology on the Environment

1 Term – 1 Course Credit, RMC - Distance Education - Delivered one or two terms each year 1998 –2001

The relationship between humanity and the environment is first discussed and the biogeochemical cycles (carbon, nitrogen, sulfur and phosphorus) and the concepts of ecology and ecosystems are covered. Atmospheric processes are then studied, including the ozone layer, greenhouse effect, pollutants and the role of the atmosphere as a filter. Water pollution is also covered focussing on quality parameters and guidelines and, specifically, the Great Lakes. Humanity's impact is covered by studying population growth, energy (sources, currencies, forecasts and conservation) and environmental legislation, including the concept of due diligence.

CCE 285 - Introduction to Environmental Impact Assessment

1 Term – 1 Course Credit, RMC - Distance Education - Delivered one or two terms each year 1999 –2001

This course prepares students to complete and review Environmental Impact Assessments. The origins, philosophies and approaches to environmental assessment are compared and discussed in detail. The Canadian Environmental Assessment Act (CEAA) is studied in detail, including its history, application, regulations, and process. The students are introduced to the assessment of social and economic impacts as well as biophysical impacts. Typical impacts from industrial operations are discussed. Students apply the knowledge and skills in the application of environment assessment at the screening level to typical projects or operations.

CCE 386 Introduction to Environmental Management

1 Term – 1 Course Credit, RMC - Distance Education RMC – Delivered 2001- 2004

Introduction to Environmental Management Systems (EMS), provides an overview of principles and basic practices of environmental management. These principles and practices are based on the ISO 14001 Standard for Environmental Management, which is the international standard for environmental management adopted by industry and government world-wide. The Canadian Federal government has adopted the principles of this standard for all federal departments and organizations. The key principles of EMS are discussed in detail, as well as how to implement an EMS for an organization. The definitions and requirements of ISO 14001 are dealt with in detail. The course also discusses the concepts of environmental performance indicators, and encourages one to think about environmental responsibilities from personal and professional perspectives.