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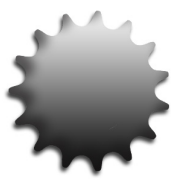

North Atlantic University Union

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Plenary Lecture 1

Lessons Learnt on Industrial Ecology as an Optimization Mechanism within the Multi-Dimensional Domain of Sustainable Development, Energy/Materials Saving and Environmental Preservation

Associate Professor Dimitris Sidiras
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Abstract: Industrial Ecology is a systemic/multidisciplinary discourse dedicated to the optimization of energy and material flows through an industrial domain, mapped as a network of processes that extract/modify natural resources, thus interconnected with the environment, where residues/wastes are also discharged. This optimization is examined in the present work by using energy/materials saving (E/M) and sustainable development (S) as main factors. In an attempt to investigate the relation between these factors, we set S as the dependent variable (output) and a composite index I, based on the weighted combination of E and M, as the independent variable (input). The optimal value Iopt is found at the minimum value Smin of the objective function S(I), which consists of two conflict variables S1 and S2, based on the beneficial action of energy/materials saving and the flexibility decrease (due to sacrifice of degrees of freedom to obtain higher I-values, implying also higher compactness of the industrial processes network), respectively. Since the demand for energy/materials depends also on the level of S, which is changing in the time course, we should deal with an implicit function of the form f (S, E, M) = 0 rather than with an explicit function of the form S = f (E,M). Therefore, we can obtain an internal triangular relation between S, E, M, having a gravity center near the variable playing the most significant role. Nevertheless, we can reduce the generalized implicit function to its corresponding explicit form by setting the variable to be interconnected mostly with the strategic task as the depended one. Three case examples are presented to illustrate real situations, where S, E, M, correspond to a strategic target set a priori, respectively.

Brief Biography of the Speaker: a) Studies: Diploma, Chemical Engineer, Department of Chemical Engineering, National Technical University of Athens, 1984. Doctor of Engineering (Ph.D.), Department of Chemical Engineering, National Technical University of Athens, 1990
b) Academic Positions: Associate Professor, Department of Industrial Management & Technology, University of Piraeus, Piraeus, Greece
c) Scientific Activities (research, publications, projects, etc.…): Research interests include: experimental and computational simulation of industrial/chemical processes; economo-technical analysis of industrial branches/organic chemical industry; renewable energy sources; biomass; natural resources management; GIS based management; environmental management; manufacturing of agricultural product/byproducts; teaching methodology; distance learning. 17 publications in ISI journals, and 80 in conference proceedings (after peer-review), with 263 citations and an h-index of 10 (source: ISI Web of Science, Thompson Scientific; self-citations excluded). I participate continuously since 1989 in the European Biomass Conferences and published more than 26 papers in their proceedings, while recently I joined the conference's scientific committee.
d) WSEAS Activities (papers, sessions, organization of sessions, organization of conferences, books, special issues in the journals etc… within WSEAS)

Plenary Lecture 2

Sustainability Lessons Learnt from Traditional Buildings

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Abstract: Logic lies in the experience. Efficient and rational usage of the climate in shaping of the living spaces as a basic building - environmental subject is observable in the most of our ancestors' fundamental methods and principles. Sustainable architecture of traditional buildings with their innovative construction of that time and low impact on the environment, has presented the best performance in terms of energy sustainability. According to this fact that use of pattern is one of the characteristics of the sustainable traditional architecture; consideration and investigation in environmental architecture of sustainable traditional buildings and using intelligent passive methods and experiences can be sustainable guides for contemporary constructions without imposing additional cost by optimization of energy consumption, But learning of the traditional architecture does not mean imitation of the past forms while the logic of traditional forms should be learnt and valuable experiences of the intelligent passive methods in buildings and cities should be investigated.

Architects, engineers and building science researchers are interested in investigation of sustainable traditional buildings and lessons learnt for new contemporary constructions, so sustainability items of traditional buildings can be considered as effective factors to achieve sustainability goals. This session examines the effects of the climatic, socio-cultural and economic factors on shaping of architecture and construction of sustainable traditional cities and identification of their strategies, meanwhile tries to consider sustainability, human thermal comfort criteria, climatic building requirements and new construction guidelines according to vernacular architecture findings and the latest achievement in climatic architecture based on natural energies without needing to mechanical systems. So this session deals with spatial characteristics of building form and construction by strong cultural background that has worked in a long time in specific climatic conditions.

The aim of this invited session is to provide a forum for the presentation of papers on lesson learnt from sustainable traditional buildings for contemporary construction. Papers are invited on the following topics, or other related themes:

- Energy sustainability
- Sustainable materials in traditional buildings
- Low energy architecture
- Innovation in sustainable buildings
- Sustainable education in architecture and urban design
- Sustainable calendar buildings
- Passive heating, cooling and ventilation methods
- Cultural aspects in Sustainable architecture
- Sustainable water use in architecture and urban design
- Restoration and rehabilitation of sustainable buildings

Brief Biography of the Speaker: Dr. Ahadollah Azami was born in Marand, Iran in 1977. He is head of Iranian Domestic Technologies Society in the north west of Iran. Meanwhile he is coordinator of Swedish Ecological Centre (EKOCENTRUM) in the north west of Iran and also member of International Solar Energy Society (ISES), ASES, IRSES, ASCE, and ASME and WSSET.

He developed the original of old and ancient sustainable architectural methods to contemporary functions especially in the field of Sustainable solar architecture, urban design and zero energy buildings. His researches are focused on various topics such as culture, education, water, solar buildings; technical restoration and renovation of historical buildings and sites approaching sustainability and development. He has one invention in solar architecture and has awarded some national and international prizes around the world.

Plenary Lecture 3

Nanotechnology Approach in Membrane Fabrications for Environmental Applications

Professor Abdul Wahab Mohammad
Head Centre for Sustainable Process Technology (CESPRO)
Faculty of Engineering and Built Environment
Universiti Kebangsaan Malaysia
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Abstract: Membrane process is a technology that has been widely used for various separations within the various industries. There are variety of membrane processes such as microfiltration (MF), ultrafiltration (UF), nanofiltration (NF), reverse osmosis (RO), gas separation, dialisis, electrodialisis and pervaporation. For environmental applications focusing on water and wastewater treatment, UF, NF and RO have been used widely. However problems still persist especially regarding fouling-prone membranes, low flux and low selectivity. Various studies have been conducted to fabricate membranes with superior performance. Towards this end, nanotechnology approach in membrane fabrications may be the solution. Among the strategies that have been adopted include: (i) learning the behavior of membrane cell in nature and adopting it in synthetic membranes, (ii) utilization of carbon nanotubes as nanostructured pores, and (iii) utilization of other nanoparticles to produce membranes with antifouling properties. The talk will discuss these advances and future potential research areas.

Brief Biography of the Speaker: Abdul Wahab Mohammad is currently Professor in the Department of Chemical and Process Engineering at Universiti Kebangsaan Malaysia (UKM), Bangi and Head Centre for Sustinable Process Technology (CESPRO). He was previously Director of Industry Liaison Office and Deputy Dean of the Engineering Faculty at UKM. He joined UKM as a lecturer in 1991 and was appointed Professor of Membrane and Separation Technology in 2005. Abdul Wahab obtained his BSc from Lehigh University USA and MSc from Purdue University, USA both in Chemical Engineering. He subsequently obtained his PhD in Membrane Technology from The University of Wales, Swansea, UK. Abdul Wahab is also a registered professional engineer (PEng) with the Board of Engineers Malaysia (BEM) and has been actively involved as a lead chemical engineering accreditor with the Engineering Accreditation Council under BEM. His research interest has been on membrane separations especially on nanofiltration and ultrafiltration for applications in Food, Biotechnology and Water industries. He was the co-recipient of the Prince Sultan International Water Award in 2008. He is also curently editorial board member for Desalination and a few other journals. He has published extensively within these areas of research with more than 1400 citations.

Plenary Lecture 4

Artificial Photosynthesis for Sustainable and Environmental Friendly Construction: A Review

Professor Muhammad Fauzi Mohd
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Faculty of Engineering and Built Environment
Universiti Kebangsaan Malaysia
MALAYSIA
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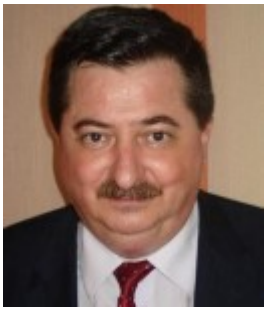
Abstract: Artificial photosynthesis processes using semiconductor as photocatalyst, has emerged as an important destructive technology leading to the formation of eco-friendly end products. Interesting part of this process is the ability to convert pollutants into harmless substances directly in the contaminant source. Recently, artificial photosynthesis is a modern technology, which has potential for the reduction of “global warming”. This paper reviews recent developments in this emerging technology and provides information on the parameters that control the process. The effects of the photosynthetic reaction on the cementations materials are discussed and future potential applications of this technology are also considered. Finally, it also provides the scope for the future research on this topic with adequate literature support.

Brief Biography of the Speaker: Muhammad FauziMohdZain is the Deputy Dean of Postgraduate and Development at the Faculty of Engineering and Built Environment, UniversitiKebangsaan Malaysia. A graduate of Kyushu University, Japan, Fauzi’s area of expertise lies in Sustainable/Concrete Technology & Advanced Materials. He has published extensively in local and international journal and has received several medals at the International Invention Exhibition over the past years. Amongst some of his product and inventions are the Dielectric probe system for non-destructive testing & evaluation of building materials. (Gold Medal, Geneva 2004/Patent), Expert system for high performance concrete mix design for Malaysian climate (Silver Medal, Geneva, 2004/Copyright).His research areas are in Sustainable construction materials and building systems. He is recognised as a council member of the Concrete Society of Malaysia and is an expertise consultant in his area of research for MOSTI, SIRIM, CIDB and ACI. He has been a Visiting Fellow at the Kyushu University and a Visiting Scientist at the Centre for Building Performance & Diagnostics, Carnegie Mellon University, USA.

Plenary Lecture 5

Multiobjective Optimization and Decision Making for Electricity Distribution Systems



Professor Mihai Gavrilas
Departmenet of Power Systems
"Gheorghe Asachi" Technical University of Iasi
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Abstract: The electricity world is currently witnessing the development of present day transmission and distribution power networks to the Smart Grid concept. This process implies the large-scale integration of renewable energy sources, the development of electricity markets, changing grid infrastructure and operation due to plug-in electric vehicles penetration, transforming the consumer into an active player on the production-distribution-demand chain, and an overall increasing complexity of decision making. This progress will focus to the smart integration of all players to ensure a reliable and effective supply of all customers, under sustainable, economic and high security conditions. Under the umbrella of these fundamental changes, new and more complex optimization problems will arise, that must be solved trying to find good solutions complying with more, and frequently conflicting, objectives. These challenges will address new issues such as new operation strategies based on smart equipments and devices deployed in the distribution network, control of plug-in electric vehicles interaction with the network based on market strategies, new Intelligent Home Automated solutions, Demand Response and other Demand-Side Management strategies or efficient Generation-Side Management through Virtual Power Plants models.

Brief Biography of the Speaker: Mihai Gavrilas received the M.Sc. degree from the "Gheorghe Asachi" Technical University of Iasi, Romania, in 1984. Since 1988 he has been devoted to education and research at the "Gheorghe Asachi" Technical University of Iasi, where, at present, he is a professor with the Power System department, at the faculty of Electrical Engineering. In 1994 he received the Ph D degree in power systems from the Technical University of Iasi. He is reading courses on Power systems steady state and stability analysis, Intelligent systems application in power systems and Electricity markets. He is a Senior IEEE member (Power and Energy Society, Computational Intelligence Society, Systems, Man and Cybernetics Society) since 1994 and a CIGRE member since 2008. His main research interests are directed towards multi-objective optimization in power systems, power systems dynamics and control, state estimation and observability analysis in power systems, and computational intelligence application in power.

Plenary Lecture 6

The Melting of the Cryosphere and Implications for the Planet

Associate Professor Rich Snow
Embry-Riddle Aeronautical University
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Abstract: As global temperatures increase, ice sheets and glaciers are rapidly melting. Sea levels continue to rise forcing the relocation of low-lying populations and threatening water supplies for millions of people. On the west coast of Greenland, the average temperature in winter has risen 5°C in the past two decades. In the Arctic, sea ice is on the decline with the ice pack getting thinner and thawing further from shore. The current rate of sea ice loss during the summer is about 10 percent per decade. At the current rate of melting, the Arctic Ocean could be completely ice free by the end of the 21st century. The average temperature of the West Antarctic Peninsula has increased by more than 2°C since the 1950s and the midwinter temperatures have warmed by as much as 5°C during the same time period. The second largest iceberg ever measured broke free from the Ross Ice Shelf in March 2000, and in 2002, the Larsen Ice Shelf lost 1200 square miles of ice. Warmer temperatures are causing glaciers in the Himalayas and the Tibetan Plateau to melt faster during the summer, causing major flooding in the lowlands while the lack of snowfall at higher elevations during the warmer winters is causing drought. The same is true of the glaciers along the equator in Africa including Mt. Kilimanjaro. The glaciers in the European Alps have decreased by 50 percent since the 1900s and are predicted to disappear by the middle of the 21st century. And, Glacier National Park has lost 80 percent of its glacial ice since 1850 and is expected to be ice free within 30 years, which could cause the name of the park to be changed. This research examines the current state of the cryosphere and the negative impacts associated with melting glaciers.

Brief Biography of the Speaker: Dr. Rich Snow teaches Meteorology, Climatology, Climate Change, Geographic Information Systems (GIS) and Research Methods and Statistics in the Department of Applied Aviation Sciences at Embry-Riddle Aeronautical University, Daytona Beach, Florida. He earned a Ph.D. in Physical Geography with a specialty in Life Sciences from Indiana State University as well as a Master of Science degree in Geoscience and a Bachelor of Science degree in Geography with a Philosophy minor from Western Kentucky University. Dr. Snow has presented research to numerous professional organizations such as the American Meteorological Society, the National Weather Association, the National Council for Geographic Education, the Association of American Geographers, the Florida Academy of Science, and the University Aviation Association. He and his wife, Dr. Mary Snow, have presented at international conferences in Greece, Germany, France, the Netherlands, England, Cancun, the Bahamas, and Hawaii. The pair have co-authored dozens of refereed journal articles and published numerous papers in peer-reviewed conference proceedings. The Snows recently co-authored a textbook entitled Climatology: An Atmospheric Science published by Prentice-Hall.

Plenary Lecture 7

Feedback Control of Simple Model Systems of Climate Dynamics

Professor Ramesh K. Agarwal
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Abstract: Over the years, there has been considerable effort in developing climate models that can predict the future climate of the globe with reasonable confidence. These models account for various physical phenomenon which can affect the future climate. One of the key goals of these models is to predict the mean global surface temperature of the earth because of considerable concern about global warming and its impact on the earth ecosphere. The prediction of global warming by using climate models requires coupling of several effects over many spatial and temporal time scales, namely the modeling of fast atmospheric circulation on a daily or weekly time scale to slow large scale oceanic circulation on time scales of centuries to millennia. The global warming is also influenced by the feedback mechanisms that include water vapor concentration and cloud feedback, desertification, variations in polar ice-cap and anthropogenic CO2 emissions and other greenhouse gases. Accounting for all these effects in great detail has led to very complex computer models of climate prediction. In this paper, we consider a very simple climate model governed by two ordinary non-linear differential equations, one for the earth surface temperature and the other for atmospheric temperature. The models accounts for most of the important physical effects. It is an energy balance model and not a global circulation model. The goal of this paper is to formulate and employ an optimal feedback control strategy using this simple climate model that can provide an emission scenario for CO2 which will restrict the global surface temperature to a specified increase (say of 2 degrees) by a given target year (say 2050). This result can then be used by the policy makers to develop strategies for reducing the CO2 emissions to the levels suggested by the model; these strategies could include switching to renewable energy sources, CO2 capture and sequestration (CCS), and energy efficiency among others.

Brief Biography of the Speaker: Professor Ramesh Agarwal is the William Palm Professor of Engineering and the director of Aerospace Engineering Program and Aerospace Research and Education Center at Washington University in St. Louis. From 1994 to 2001, he was the Sam Bloomfield Distinguished Professor and Executive Director of the National Institute for Aviation Research at Wichita State University in Kansas. From 1978 to 1994, he worked in various scientific and managerial positions at McDonnell Douglas Research Laboratories in St. Louis. He became the Program Director and McDonnell Douglas Fellow in 1990. Dr. Agarwal received Ph.D in Aeronautical Sciences from Stanford University in 1975, M.S. in Aeronautical Engineering from the University of Minnesota in 1969 and B.S. in Mechanical Engineering from Indian Institute of Technology, Kharagpur, India in 1968. Over a period of 35 years, Professor Agarwal has worked in Computational Fluid Dynamics (CFD), nanotechnology and renewable energy systems. He is the author and coauthor of over 300 publications and serves on the editorial board of fifteen journals. He has given many plenary, keynote and invited lectures at various national and international conferences worldwide. Professor Agarwal continues to serve on many professional, government, and industrial advisory committees. Dr. Agarwal is a Fellow of seventeen societies - American Association for Advancement of Science (AAAS), American Institute of Aeronautics and Astronautics (AIAA), American Physical Society (APS), American Society of Mechanical Engineers (ASME), American Society of Civil Engineers (ASCE), Royal Aeronautical Society (RAeS), Society of Manufacturing Engineers (SME), Society of Automotive Engineers (SAE), Institute of Electrical and Electronics Engineers (IEEE), American Society of Engineering Education (ASEE), American Academy of Mechanics (AAM), Institute of Physics, Energy Institute, Institute of Engineering and Technology, Academy of Science of St. Louis, Australian Institute of energetic Materials, and World Innovation Foundation (WIF). He has served as a distinguished lecturer of AIAA (1996-1999), ASME (1994-1997), IEEE (1994-2011), and ACM (2011). He has received many honors and awards for his research contributions including the ASME Fluids Engineering Award (2001), ASME Charles Russ Richards Memorial Award (2006), Royal Aeronautical Society Gold Award (2007), AIAA Aerodynamics Award (2008), AIAA/SAE William Littlewood Lecture Award (2009), James B. Eads Award of the Academy of Science of St. Louis (2009), SAE Clarence Kelly Johnson Award (2010), SAE Franklin W. Kolk Progress in Air Transportation Award (2010), ASME Edwin Church Medal (2011), AIAA Thermophysics Award (2011), SAE John Connors Environmental Award (2011), ASME Dedicated Service Award (2012), IET Heaviside Control Award (2012)