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# SUSTAINABILITY in SCIENCE ENGINEERING

VOLUME I

Proceedings of the 11th WSEAS Int. Conf. on SUSTAINABILITY  
in SCIENCE ENGINEERING (ESE 09)

**Editors:**

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Prof. Bob Corneliu, "Politehnica" University of Timisoara, Romania  
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Prof. Ianca Sevastean, "Politehnica" University of Timisoara, Romania  
Prof. Stoian Valeriu, "Politehnica" University of Timisoara, Romania

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## **Preface**

This year the 11th WSEAS International Conference on Sustainability in Science Engineering (SSE '09) was held in Timisoara, Romania. The Conference remains faithful to its original idea of providing a platform to discuss theoretical and applicative aspects of sustainability in civil engineering and infrastructure, mechanical engineering, electrical and electronical engineering, chemical engineering etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be indexed by ISI. Please, check it: [www.worldses.org/indexes](http://www.worldses.org/indexes) as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

A Conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors



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## Plenary Lecture 1

### Aspects on Compact Electrical Drive Systems



**Professor Nicolae Julia**

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**Abstract:** The paper presents some aspects on actual directions regarding electrical drive systems field. The necessity to developing compact drive systems and the present world economical situation determine the manufacturers to concept special integrate drive systems, where there are at least three fundamental requirements: minimal specific weight (kg/W), high reliability, low manufacturing costs. The analyzed integrated system includes: electrical servomotor, speed transducer, position transducer, electro-magnetical brake, mechanical gear, control and power electronic. Each from the above system components has original elements, as follows:

- a brushless servomotor having a fractional number of slots per magnetic pole
- a speed transducer, where the output is processed linear trough digital methods
- no conventional solutions to develop very compact brake systems, as well as mechanical gear
- vectorial analysis for the control system.

**Brief Biography of the Speaker:** Nicolae Julia was born on December 14th, 1945 in Hunedoara County, Romania. He received the degree in electrical engineering in 1969 from Bucharest Polytechnic Institute and Ph.D. in 1986. During 1969 – 1978, he was scientific researcher at National Institute for Aerospace Research, Bucharest and he participated at the international project for research, design and production of the military aircraft YUROM versions IAR – 93 and ORAO – 2. He was in charge with development of electrical installations, special installations and board equipment for the military aircraft. Since 1978, he is working within Military Technical Academy Bucharest and currently he is Professor of Measurement Systems at the Faculty of Military Electronic and Information Systems. His present research interest includes sensor interface systems, analogue circuit design, signal processing, transducers and electrical servomotors, measurement theory and low – frequency measurements. He has published more 180 technical papers and 20 books and he was involved in numerous national research projects out o which he had Project Coordination responsibilities in 10 projects. The national projects were developed on the following programmms: AEROSPATIAL, SECURITATE, CALIST, RELANSIN and CEEX. Out of the international contracts in which I am involved I would like to mention FP7 - CEARES project which will be finished in 2010. The main objective of the project is to enhance regional cooperation in aeronautical research and development among different universities and research centers from the Central European region involving: Austria, Bulgaria, Czech Republic, Estonia, Herzegovina, Latvia, Lithuania, Poland, Romania, Serbia, Slovakia and Hungary. I am member of the Aero-Astronautics Committee from the Technical Division of the Romanian Academy since 2002. I am Vicepresident of the Academy of Cybernetics "Stefan Odobreja" founded in 1982 and registered in Swisserland in Lugano.

## Plenary Lecture 2

### Life-Time Prediction of Structural Parts under Variable Creep Conditions



**Professor Dimitrios G. Pavlou**

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**Abstract:** The life time of structural components under variable stress and temperature creep conditions is difficult to be estimated. Although a lot of models describing the micro-mechanisms of creep failure are currently available, above models are not suitable for solving real engineering problems because of using large number of experimental parameters. The present lecture is concerned with the presentation of a non-linear macroscopic model for creep-life prediction of structural elements under step-wised variable stress and temperature conditions. Proposed model has two main advantages: (a) takes into account the previous damage history and the loading order effect, and (b) it is based on results of conventional constant stress and temperature tests. It is shown that the most known of the existing models are particular cases of the proposed model. Theoretical predictions are correlated well with test results for two metallic materials (austenitic steel and aluminum) subjected to high temperatures and square block loading. Comments of the evaluation of the proposed model by other independent researchers are also presented.

**Brief Biography of the Speaker:** Dimitrios G. Pavlou is Professor of Metallic Structures and Applied Mechanics in the Faculty of Mechanical Engineering of the Technological Institute of Halkida –TEI Halkida– Greece (website: [www.teihal.gr](http://www.teihal.gr)). He earned undergraduate degree in Mechanical Engineering and PhD in Fracture Mechanics at the University of Patras. He has extensive industrial experience in engineering design and many years of experience in teaching Strength of Materials (theory and experimental exercises), Fracture Mechanics, Metallic Structures, Structural Analysis and Material Science at the Hellenic Air-Force Academy, University of Piraeus, University of Patras and Technological Institute of Halkida. He has been the General Manager of the VIOTE S.A. (Viotia's Prefecture Company for Industrial Development), Head of the Secretary of the Research Centre of the University of Piraeus and Chair of the Faculty of Mechanical Engineering of the Technological Institute of Halkida. Pavlou has been on the Faculty of the TEI of Halkida since 1999 and is currently Visiting Professor in the "Polytechnic" University of Timisoara, Romania. He is: (a) author of numerous research articles in referee journals and international conferences, (b) author of national and international books covering fracture mechanics, metallic structures, damage mechanics and strength of materials, and (c) referee of numerous research works submitted to international journals and conferences. His research interests are: (a) Analytical and Numerical methods in Fracture Mechanics with special emphasis on solution of Boundary Integral Equations (BIE) using Green's functions and BEM, (b) Damage Mechanics with special emphasis in Fatigue and Creep Damage Accumulation under variable loading as well as life-time prediction of structural parts in service conditions, and (c) Analysis of elastostatic problems using Integral Transforms with special emphasis on Hankel Transforms.

## Plenary Lecture 3

### Technical Systems Sustainability Approach to Framing Industrial Ecosystems



**Professor Cornelia Aida Bulucea**

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**Abstract:** This study is an attempt to demonstrate that the conceptual framework of Industrial Ecology offers a new direction for identifying and implementing the strategies to reduce the environmental impacts of equipments and processes associated with industrial systems. The present industrial metabolism, based on Earth resources depletion and environmental destruction, should be critically reassessed from a sustainability perspective. Within the industrial society we face a future of threats, frustrations, limitations, and, still, hopes. The humans further challenges are doubtless related to sustainable industrial metabolism, an emphasis on harmoniously integrating industrial activity into ecological systems. An approach of technical systems (created by humans) and ecological systems (created by Nature) as parts of the same system, the industrial ecosystem, could provide a holistic view of the interactions and symbiosis interrelationships among human activities, industrial practices and ecological processes. Consequently, in this study will be pointed out the key concepts and tools suitable for the electrically driven systems analysis within the ecosystems models framework. By tracing the flows diagrams of energies and materials during manufacturing processes, achieving the exergy balance equations for different stable states of the electrically driven system and modeling the system operation regimes, one could attempt to minimize the environmental impacts and optimize the efficiency of material and energy use within the industrial ecosystems. Further on, the concepts and tools of Industrial Ecology would offer a correct orientation to replace the present industrial culture with a sustainable development culture that will be economically, socially and environmentally acceptable. There are our moral obligations to accept that the industry is partly the problem, as well as Science and techniques are the solution for an economical development based on an industry in harmony with the environment.

**Brief Biography of the Speaker:** Cornelia Aida Bulucea is currently an Associate Professor in Electrotechnics, Electrical Machines and Environment Electrical Equipments in the Faculty of Electromechanical and Environmental Engineering, University of Craiova, Romania. She is graduate from the Faculty of Electrical Engineering Craiova and she received the Ph.D degree from Bucharest Polytechnic Institute. In Publishing House she is author of four books in electrical engineering area. Research work is focused on improved solutions for electrical networks on basis of new electric equipments and environmental impact of energy and electric transportation systems. She has extensive experience in both experimental and theoretical research work, certified by over 50 journal and conference research papers and 13 research projects from industry. She has held in the Association for Environment Protection OLTENIA and she is a regular invited keynote lecture for environmental engineering symposia organized by Chamber of Commerce and Industry OLTENIA. Due to WSEAS recognition as huge scientific Forum she participated in five WSEAS International Conferences, presenting papers and chairing sessions. She was Plenary Lecturer in the WSEAS International Conference on POWER SYSTEMS, held by the University of Cantabria, Santander, Spain, September 23-25, 2008. She is very proud of her 10 papers published in the WSEAS Conferences Books and 3 papers published in WSEAS TRANSACTIONS ON ENVIRONMENT AND DEVELOPMENT, and in WSEAS TRANSACTIONS ON ADVANCES IN ENGINEERING EDUCATION.

## Plenary Lecture 4

### Sustainability of New and Strengthened Buildings



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**Abstract:** The lecture deals with some aspects on sustainability of the new buildings and of strengthened structures as well as with self-compacting concrete. The first part of the presentation is devoted to the energy incorporated in main building materials and the importance of thermal insulation, air tightness and thermal mass of the building envelope. For the strengthened structures, the calculated components of sustainability like total cost of rehabilitated solution, energy used with raw materials and consolidation time are presented. For the concrete self – compacting with reliable workability characteristics, fast-curing grade for precasts elements and material with significantly increased strengths parameters have been developed to a stage where the concrete can be used, as sustainable material, in day-to-day building practice.

**Brief Biography of the Speaker:** Prof. Corneliu BOB, graduated at the University „Politehnica” of Timisoara – Romania in 1961 and Ph.D. Civil Engineering in 1971 at the same University. In 1990 he became professor of R.C. Structures and Ph.D. – Scientific Coordinator at the Civil Engineering Faculty in Timisoara. From 1996 till 2004 he was the Head of the National Building Research Institute – Timisoara Branch. Professor Bob has also been very active in the Romanian Associations for Civil Engineering: National Association Engineering for Structural Analysis, Bucharest, Romanian Concrete Commission, Romanian Academy – Material Science. Member of IABSE since 1992, Prof. Bob became the member in Permanent Committee and Commission WC-8.

Prof. Bob has had many and major contributions in the field of Structural Engineering:

(i). He participated as designer at more than 65 structures projects. In the last 15 years his attentions was paid to the design of the RC prefabricated structures: 22 structures have been projected and built up with more than 100000 m2 built surface. An important contribution of Prof. Bob in this field was in a patent concerning the „RC prefabricated structures with rigid nodes”.

(ii). A very important field of work was paid to evaluation and rehabilitation of existing buildings. He participated at 75 projects of maintenance and rehabilitation of some important structures affected by seismic actions, gas explosions as well as time environmental factors. A very notable contribution is the „Model of reinforcement corrosion in RC Structures.

(iii). Prof. Bob C. has published 20 books and 225 papers in Journals and Proceedings of National and International Meetings. The field of interest of works is: rehabilitation of structures, analysis and design of structures, durability of buildings, new special concrete types.

Prof. Corneliu BOB played an important role in development of assessing of existing structures and in design of new buildings and he has devoted great energy in promoting the role of students and young engineers as designers and researchers.

## Plenary Lecture 5

### A Sustainable Feeding System for Our Future: The Passive Greenhouse



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**Abstract:** This presentation is dealing with the feeding resource and the ecological reconstruction opportunity opened by the extended use of the energetic passive greenhouses, independent of any conventional infrastructure. We are presenting a specific passive greenhouse configuration. The main heating/cooling device is a heat pump. A dc wind generator and solar panels are also included. A structural model of the passive greenhouse is proposed.

#### **Brief Biography of the Speakers:**

Valentina E. Balas is currently an Associate Professor in the Department of Automatics and Applied Informatics at the Faculty of Engineering, University “Aurel Vlaicu” Arad (Romania). She holds a Ph.D. in Applied Electronics and Telecommunications from Polytechnic University of Timisoara since 2003. She is author of more than 90 research papers in refereed journals and International Conferences. Her research interests are in Intelligent Systems, Fuzzy Control, Smart Sensors, Information Fusion, Modeling and Simulation.

She is Editor-in Chief to International Journal of Advanced Intelligence Paradigms (IJAIP) and member in Editorial Boards for national and international journals.

She participated in many international conferences as General Chair, Organizer, Session Chair and member in International Program Committee

Dr. Valentina E. Balas has a great experience in research projects. She is member of EUSFLAT, ACM and a Senior Member IEEE.

Marius M. Balas is currently an Associate Professor in the Department of Automatics and Applied Informatics at the Faculty of Engineering, University “Aurel Vlaicu” Arad (Romania). He holds a Ph.D. in Applied Electronics and Telecommunications from Polytechnic University of Timisoara since 2001. He is author of more than 80 research papers in refereed journals and International Conferences. His research interests are in Fuzzy-Interpolative Controllers, Air conditioning, greenhouses, ABS braking and Autonomous Intelligent Cruise Control, etc.

He is member in Editorial Boards for national and international journals and participated in many international conferences as Organizer, Session Chair and member in International Program Committee.

Dr. Marius M. Balas has a great experience in research projects. He is member of EUSFLAT and a Senior Member IEEE.



