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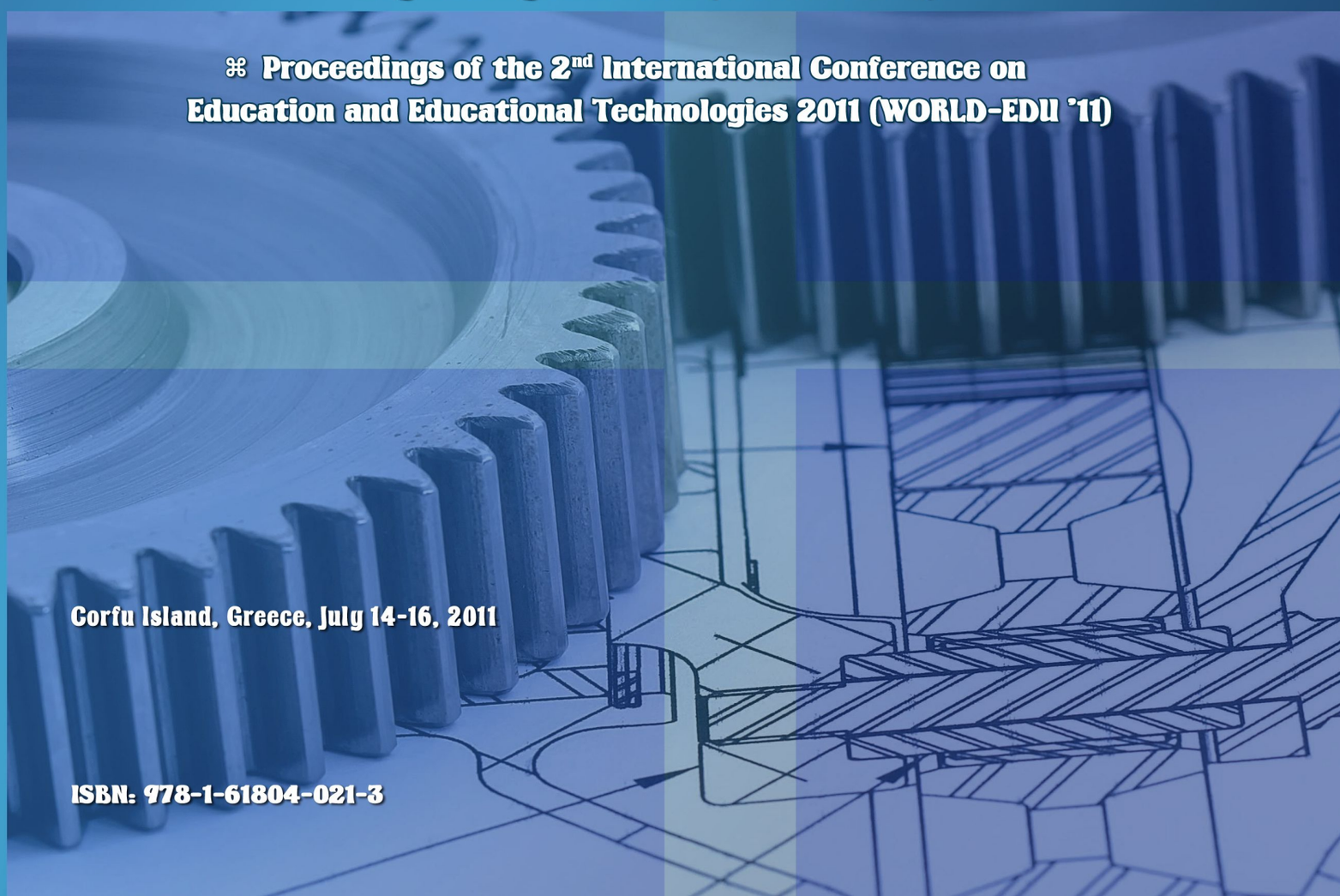

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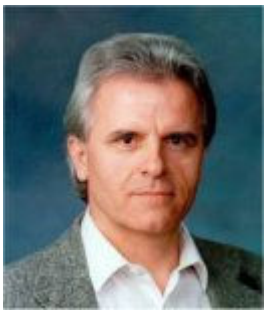
Keynote Lecture 1

Fundamental Laws of Nature: Mass-Energy, Work, Heat and Entropy From Reversible Isentropic to Irreversible Caloric Processes



Professor M. Kostic
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Abstract: The phenomenological Laws of Thermodynamics have much wider, including philosophical significance and implication, than their simple expressions based on the experimental observations – they are the Fundamental Laws of Nature. The Fundamental Thermodynamic Laws of Nature (The First, Second, Zeroth and Fourth) are defining and unifying our comprehension of all existence in universe (all natural systems defined by their properties and processes) and all changes in time (all natural processes, including life), which are in turn caused by mass-energy transfer, from one system or subsystem to another, due to non-uniform mass-energy distribution in local space and/or universe. Due to universality and diversity of Thermodynamics (The Laws of natural, including man-made processes and properties), it appears to be abstract and difficult to comprehend, regardless that the "cause-and-effect" Laws of Nature are obvious, logical and simple. The fundamental Laws of Nature are exceptionally simple but they appear in exceptionally many different forms, which explain universality and unity of simplicity and complexity, but also difficulties to recognize simplicity in complex diversity.
The basic concepts will be systematically defined and illustrated first by simple ideal-gas systems and reversible processes, and then expended to real systems and unavoidable process irreversibility. The hart of Thermodynamics is energy, which is 'contained' within, i.e. defines a mass-energy system which occupies a space, and thus is the 'building block' and fundamental property of matter and space, and in turn, the fundamental property of existence. Furthermore, the mass and energy are manifestation of each other and are equivalent; they have a holistic meaning of mass-energy. Moreover, energy exchanges from one to another system or subsystems are related to energy transfer in time across a real- or imaginary-interface boundary-surfaces between and within the systems, i.e. energy transfer is associated with all processes (or changes) and, thus, indivisible from time. The forces, causing the mass-energy displacement/transfer, thus defining the process direction are manifested by tendency or actual mass-energy transfer due to non-equilibrium of mass-energy in space. The non-equilibrium, i.e., non-uniform distribution of mass-energy in space tends, in time, to spontaneously and irreversibly redistribute over space towards common equilibrium, thus non-equilibrium cannot be spontaneously created. All natural spontaneous, or over-all processes (proceeding by itself and without interaction with the rest of the surroundings) between systems in non-equilibrium have tendency towards common equilibrium and thus irreversible loss of the original work potential (measure of non-equilibrium), by converting (dissipating) other energy forms into the thermal energy accompanied with increase of entropy (randomized equi-partition of energy per absolute temperature level). These fundamental concepts will be revisited and highlighted using typical and characteristic natural processes with an objective to explain, clarify, and resolve any misunderstanding by correlating and unifying different approaches and nomenclature, related to the universal concept of mass-energy in space and time.
The philosophic axiom "causa aequat effectum," traced to ancient philosophers, represents the most universal and fundamental law of nature, including existence and future, i.e. past and future transformations. By the beginning of the 20th century scientists had established conservation laws governing the following quantities: energy, mass (or matter), linear momentum, angular momentum, and electric charge. Conservation laws have the broadest possible application of all laws in physics and are thus considered by many scientists to be the most fundamental laws in nature. As such the fundamental laws are taken as axiomatic and many believe they could not be questioned, explained or proven. However, everything may and should be questioned, reasoned, explained and possibly proven. The miracles are until they are comprehended and understood.

Brief Biography of the Speaker:
Milivoje M. Kostic, Ph.D., P.Eng., Professor of Mechanical Engineering at Northern Illinois University, is a notable researcher and scholar in energy fundamentals and applications, including nanotechnology, with emphasis on conservation, environment and sustainability. He graduated with the University of Belgrade highest distinction (the

highest GPA in ME program history), obtained Ph.D. at University of Illinois at Chicago as a Fulbright scholar, appointed as NASA faculty fellow, and Fermi and Argonne National Laboratories faculty researcher. Professor Kostic also worked in industry and has authored a number of patents and professional publications, including invited articles in prestigious energy encyclopedias. He has a number of professional awards and recognitions, is a frequent plenary speaker at international conferences and at different educational and public institutions, as well as member of several professional societies and scientific advisory boards.
More at www.kostic.niu.edu (See C-Vita for more information).

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Plenary Lecture 1

Education to Sustainable Development in Higher Education Institution : Gadget or Necessity?

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France
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Abstract: Since Rio de Janeiro conference (1992), Kyoto protocol and agenda 21 definitions, the necessity of a harmonious development is now admitted by a majority of scientific and political personalities. Even if sustainable development is a complex concept, which concerns a wide range of social, scientific, economical and environmental issues, each of us is able to do something for humanity evolution. After a state of art in French higher education institutions, necessity of education to sustainable development is discussed. Human, technical, legal aspects are presented. Finally, we show some examples of concrete actions in sustainable development field in french universities.

Brief Biography of the Speaker:
Dr. Ph. Dondon was born in 1960. After his electronic engineer diploma in 1983, he worked first 5 years as product manager in T.R.T, a french radiocommunication systems company. Then, he received the Ph.D.in Bordeaux from IXL laboratory in microelectronic design in 1992.
He has a great experience in electronic teaching and is also involved in pedagogy method process.
He is also working on motivation and psychological process of teaching with Yoga masters and psychotherapist.
He has published more than 40 papers in Journals and international Conferences. He took five patents in micro electronic circuits design.

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Plenary Lecture 2

Adaptive E-Learning and the Future of Technology Enhanced Education

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Abstract: Modern young generations got used with personalization and adaptation of digital surrounding since early childhood – they grow up accustomed to customizable mobile devices, adaptable computer games, user interface, social networks and recommendation applications. Thus, when developing online courses meeting modern educational requirements, teachers should not only cover a limited set of knowledge in particular scientific domain but have also to present the knowledge in a manner appropriate for different types of learners. Adaptive e-learning systems promises a much better learning effectiveness reached by dynamical and intelligent organization of technology enhanced educational processes meeting the learning preferences, goals, performance and style of an individual or of a group of learners.

In last decade, there were proposed many techniques, methods and tools in the area of adaptive hypermedia systems concerning both modeling mechanisms and implementation issues. Adaptation techniques as adaptive navigation, content selection and link annotations are controlled by the user model and adaptation rules for providing relevant adaptation to user's preferences, knowledge/performance, goals, learning styles and navigation history. The speech will present past, present and future of adaptive hypermedia systems and will outline future development trends of technology-enhanced learning. Adaptivity will be revealed as a key factor for reaching a better appealing and satisfaction of learners from one side, and for a better efficiency of the learning process from another side.

Next, the speaker will share his experience in practical development of courseware adaptation to both learning styles and learner's performance as two important metrics of the learner model, within the scope of ADOPTA (ADaptive technOlogy-enhanced Platform for eduTAinment) project. He will discuss creation of various types such as lessons, exercise, projects, essay tasks, problem solving, games and others, in order to be used next for construction of adaptive storyboard according given instructional design. There will be presented practical results showing that students do prefer adaptive content delivery and assessment based on learning styles and knowledge level rather than traditional teaching methods.

Brief Biography of the Speaker:

Boyan Bontchev has obtained MSc degree in Computer Engineering in 1988 at Technical University of Sofia, Bulgaria, and PhD degree in Parallel Processing at Bulgarian Academy of Sciences (BAS) in 1993. During his PhD study, he has specialized in RWTH, Aachen and University of Vienna. Between 1993 and 2000, Dr. Bontchev has been researcher at BAS in the area of dataflow models and architectures and, at the same time, followed a career of software engineer and consultant within the OBLOG project initiated by CERN. He has acted as project manager in private entities in Portugal, Spain, Italy and Bulgaria. Since 2003 he is Associate Professor at Dep. of Software Engineering at Sofia University. He has participated in many research projects, both national and in the scope of EC FP5/6/7. Currently, he is project coordinator of the ADOPTA project dealing with adaptive e-learning platforms and, as well, leads a game-based learning research group. Dr. Bontchev is author of more than 80 scientific publications.

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