OPTIMALLY FUSED NT EDUCATUION: A PROPOSAL FOR COHERENT MIXTURE OF TECHNOLOGY CONTENTS

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ABSTRACT

A striking feature of nanotechnology is its enormous breadth, encompassing basic physics, chemistry and life science and the electronic, chemical and materials engineering disciplines. A thorough exposition of this broad NT contents is thus a big challenge. A cursory look at the courses offered in approximately 20 NT departments in Korean universities leads to the impression that the contents consist of a juxtaposition of courses taught independently in various departments. A question to be raised is then, how the vast NT contents can be covered effectively during the limited course of undergraduate or graduate training.

The crux of NT is its interdisciplinary nature and a goal of NT education is to nurture 'the ability to connect' as aptly expressed by Drucker. This presumes that the students be exposed to the concepts inherent in different interrelated areas. The computational science, for instance, has become an essential ingredient of NT. Here, the ability to perform large numerical simulations is important. Equally important, however, is the ability to interpret the results, for which the concepts of basic science are clearly needed.

Therefore, a key challenge is to provide the basic concepts in interrelated disciplines in a way more coherent than simply adding together the traditional courses offered independently. A possible way to meet in part this challenge is to initiate a new platform of the quantum mechanics which underpins NT. Here the formulation is to be minimized, while maximizing its application aspects. For example, the band theory of condensed matter should be discussed with the invention of twentieth century, namely semiconductor devices and pertinent device physics and modeling; the spectroscopy in the context of its creative application, namely the quantum electronics and optical communication; the electron tunneling in connection with the single electron transistors, reliability issue of MOSFETs and driving force for non-volatile flash EEPROM cell; the chemical bonds with the structure of macromolecules, molecular transistors and the contacts chemistry for quantum wire FETs, ect.

This kind of reorganized quantum mechanics for NT could be a viable platform from which to provide simultaneously the concept, application and interconnection. Developing such courses will require an extensive research but it could be the first step for NT education. It thus appears worth considering the establishment of the center for excellence in NT teaching, focusing mainly on an optimal mixture of constantly updated technology contents.