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

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CONTENTS OF DISCUSSION

- **Brief review of NT curricula offered**
- **Educational contents covering CNT**
- **Fusing mode**
- **Quantum Mechanics as a fusing vehicle**

COURSES OFFERED @ a Korean NT DEPARTMENT

Classical Electrodynamics I&II	Synthesis of Natural Product	Chem. NanoMolecular Complex
Organic Analytical Chemistry	Superconductivity Physics	Biomaterials Chemistry
Quantum Mechanics I&II	Bioorganic Chemistry	Synthesis of Polymers
Advanced Organic Chemistry	Adv. Biochemistry	Self Assembly & Surface Chem
Molecular Spectroscopy	Enzyme Chemistry	Nanoscopy
Solid State Chemistry	Intro. to Nano Science I&II	NEMS
Solid State Physics I&II	Cell Biochemistry	Seminar I&II
Quantum Optics I&II	Nanostructural Chem	Experiment I&II
Computational Physics	Design& Synthesis of Nano Mols.	Research I&II
Low Temperature Physics	Nano Devices	
Adv. Quantum Mechanics	Nano Catalyst	

17 courses in physics, electrical, mechanical & materials engineering

13 courses in chemistry, chemical engineering & life science

NANOEDUCATION @ CNSE, UNIV. ALBANY

- Over 60 graduate courses offered for physics, chemistry, biology, computer science & electrical, mechanical, chemical and biochemical engineering majors

- Basic principles applied to NT based devices, systems & applications

- Management courses e.g. Technical Project Management, Materials Processing Economics, Managing the Adoption of Technological Innovation

- Concentration Areas
  - ✓ Molecular Materials and Architecture: dots, wires, quantum wire transistors
  - ✓ Optoelectronic Materials, Architecture and Devices: SOCs
  - ✓ Nanosystems S & T: Design, fabrication, integration of NEMS in SOCs
  - ✓ Thin Film Structures: Self-assembly, deposition and integration of thin films
  - ✓ Nanomaterials for NT: nanoengineered materials for NT based applications
  - ✓ Nanoscale Materials Modeling, Characterization, Analysis and Metrology: Theory and simulation, quantum Monte Carlo, Classical Molecular Dynamics

RESEARCH FOCUSES @ CNSE, UNIV. ALBANY

- **Nanoelectronics and Microelectronics**
  for materials and process integration of semiconductor devices
- **Nanosystems and Microsystems including MEMS**
  for micromachining, integrated electronics with sensors and actuators in SOC
- **Nanophotonics and Optoelectronics**
  for LEDs, solid state lasers, optical communications and optoelectronic materials
- **Nanometrology, Analytical Sciences and Process Control**
  for metrology, characterization and process control
- **Nanopower**
  for high efficiency solar cells, fuel cells and compact batteries
- **Advanced Computer Modeling for Nanosystems and Processes**
  for supercomputer based modeling, process & structure simulations

COURSE SYLLABUS FOR CNT

- **Growth mechanisms and self-assembly (mat. sci., chem.)**
- **Structure and properties of SWNTs and MWNTs (mat. sci., chem. phys.)**
- **Electronic, optical, thermal, mechanical properties with reference to:**
  - **quantum wire FETs & hetero-junction devices (phys., elec.)**
  - **field emission sources (mat. sci., elec., phys)**
  - **lithium ion batteries (mat. sci., chem.)**
  - **supercapacitors and actuators (elec., phys.)**
  - **molecular sensors (chem., phys.)**
  - **hydrogen storage (chem., mat. sci.)**
  - **scanning probe tips, etc. (mech. mat. sci.)**

FUSING OF NT EDUCATIONAL CONTENTS

- **When to start ?**
  Graduate program *vs*. undergraduate & graduate program?

- **How to fuse ?**
  Juxtaposing traditional courses from various disciplines?
  Modular teaching under a general title?
  Traditional courses and interdisciplinary research?
  Developing bona fide syllabus including textbooks stressing elementary concepts?

QUANTUM MECHANICS AS A VEHICLE FOR FUSION

- **Mode of lecture:**

  Minimum formulation & Maximum application, emphasizing concepts?

- **Topics to be covered:**

  Schroedinger equation & eigenvalue problems; atoms & molecules; atomic and molecular spectra; molecules & chemical bonds; harmonic oscillator; potential barriers & tunneling; band theory of solids; quantum statistics and distribution laws; interaction of radiation with matter; scattering & charge transport;

- **Application examples:**

  p-n junctions; homo and hetero junction transistors; MOSFETs, quantum wire transistors, CNT transistors; SETs; optical & semiconductor lasers; molecular electronics; sensors and transducers

Center for Excellence for Nano Education

assessing evolving NT

updating NT knowledge base

fusing the education contents

exchanging expertise among centers