

Bio-inspired and Nanoscale Integrated Computing

EE-599, Spring 2016

2 units

Fridays 10-11:50am

COURSE INSTRUCTOR:

Dr. Mary Mehrnoosh Eshaghian-Wilner

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COURSE SUMMARY:

This course presents new insights into how bio-inspired and nanoscale devices can be used to design the next generation of enhanced integrated circuits. Graduate students in electrical engineering, computer science, and computational biology will get an introduction to the latest advances in nanotechnology and biology to computing.

The course demonstrates how nanotechnology can create even faster, denser computing architectures and algorithms. Furthermore, it draws from the latest advances in biology with a focus on bio-inspired computing at the nanoscale, bringing to light several new and innovative applications such as nanoscale implantable biomedical devices and neural networks.

GRADING:

HWS (Reading assignments only):	10%
Exam (In form of one oral in-class individual or group presentation):	20%
Quizzes (Short questions about assignments & presentations):	30%
FINAL PAPER (Can be done with groups of 2 or 3 students):	40%

PREREQUISITE: EE457 or EE451 or EE477 or EE450

COURSE OUTLINE:

Week 1 and 2. Introduction to Nanoscale devices

Week 3. Computing with Quantum-Dot Cellular Automata

Week 4. Spin-Wave Architectures

Week 5 and 6- Parallel Computing with Spin Waves and Image Processing

Week 7- Fault and Defect Tolerant Architectures for Nano-Computing

Week 8- Molecular Computing: Integration of Molecules for Nanocomputing

Week 9- Self-Assembly of Supramolecular Nanostructures

Week 10- DNA Nanotechnology and its Biological Applications

Week 11- DNA Sequence Matching at Nanoscale Level

Week 12- Computational Tasks in Medical Nanorobotics

Week 13- Biomedical and Biomedicine Applications of CNTs

Week 14- Current and Future Research

Week 15- Review

REQUIRED TEXT:

Bio-Inspired and Nanoscale Integrated Computing

Mary Eshaghian-Wilner (Editor)

ISBN: 978-0-470-11659-3

555 pages

June 2009

WILEY

ABOUT THE BOOK:

Bio-Inspired and Nanoscale Integrated Computing, published by Wiley in 2009, features an expert team of interdisciplinary authors who offer readers the benefit of their own breakthroughs in integrated computing as well as a thorough investigation and analyses of the literature. Carefully edited, the book begins with an introductory chapter providing a general overview of the field. It ends with a chapter setting forth the common themes that tie the chapters together as well as a forecast of emerging avenues of research.

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday.

Website and contact information for DSP:

http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. SCampus, the Student Guidebook, (www.usc.edu/scampus or <http://scampus.usc.edu>) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Emergency Preparedness/Course Continuity in a Crisis

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.