CS 494/594
Unconventional Computing
Bruce MacLennan, EECS
Student Learning Outcomes

1 Unconventional computing

1.1 Understand motivation for investigating unconventional computing
1.2 Understand convergence of computational and physical processes

2 Physical information processing

2.1 Understand VNL Principle
2.2 Understand value of reversible logic
2.3 Understand mechanical and thermal modes
2.4 Understand idea and purpose of ballistic computers
2.5 Understand & use reversible logic gates
2.6 Understand entropy/erasure relationship
2.7 Understand universal non-dissipative computing
2.8 Understand motivation for Brownian computers

3 Quantum computation

3.1 Use Dirac notation for linear algebra
3.2 Understand postulates of QM
3.3 Understand superposition
3.4 Understand EPR Paradox
3.5 Prove states are entangled
3.6 Derive results of q. measurements
3.7 Understand & prove No-cloning theorem
3.8 Understand capacity of qubits
3.9 Design simple quantum circuits
3.10 Understand quantum parallelism
3.11 Understand dense coding
3.12 Understand quantum key distribution
3.13 Understand quantum teleportation
3.14 Understand kinds of universal quantum computers
3.15 Understand Deutsch-Jozsa algorithm
3.16 Understand Simon algorithm
3.17 Understand Grover algorithm & heuristic search
3.18 Understand significance of Abrams-Lloyd theorem
3.19 Understand applications of q. probability in cognition
3.20 Be aware of contemporary physical realizations

4 Molecular computation

4.1 Understand basic techniques of DNA manipulation
4.2 Understand Adleman's algorithm
4.3 Understand Lipton's algorithm
4.4 Design simple filtering algorithms
4.5 Understand concept of DNA tiling
4.6 Understand sticker systems
4.7 Understand splicing systems
4.8 Understand insertion/deletion systems
4.9 Understand PAM systems
4.10 Understand universal DNA computers
4.11 Understand & design enzymatic impl. of FSA