CSCE 555 - Algorithms in Bioinformatics

1. CSCE 555 - Algorithms in Bioinformatics

2. Credit: 3-hrs; Contact: 3 lectures of 50 minutes each or 2 lectures of 75 minutes each per week

3. Instructor Dr. Jianjun Hu

4. Textbook(s) and Other Required Material: Munindar P. Singh and Michael N. Huhns, *Service-Oriented Computing*, Wiley & Sons, Inc., 2005.
   a. The text will be supplemented with research papers.
   b. All necessary software will be available for use on CSE laboratory computers or for free download for academic purposes.

5. Specific Course Information
   a. Catalog Description: Concepts, algorithms and tools for important problems in Bioinformatics, including nucleotide and amino acid sequence alignment, DNA fragment assembly, phylogenetic reconstruction, and protein structure visualization and assessment.
   b. Prerequisites: CSCE 350
   c. CSCE 5xx elective

6. Specific Goals for the Course
   a. LEARNING OUTCOMES: Specific outcomes of instruction are that students will be able to demonstrate mastery of:
      i. Foundations of molecular biology
      ii. Gene finding; Gene/protein function prediction
      iii. Algorithms for sequence pattern recognition
      iv. Phylogenetic analysis
   b. As an elective this course cannot be counted upon to contribute to the attainment of any student outcome.

7. Topics Covered:
   a. Introduction to DNA, RNA, proteins and central dogma of molecular biology
   b. Sequence alignment algorithms and sequence database retrieval
   c. Gene finding: how to find a disease gene?
   d. Gene/protein function prediction: who does what?
   e. Hidden Markov Models for sequence pattern recognition: math talks
   f. DNA regulatory motif analysis: How the billions of cells are programmed to work?
   g. Phylogenetic analysis: trace the history of human being
   h. Whole genome comparison: How different between you and chimpanzee?
   i. Introduction to Structural bioinformatics: protein folding

j. Microarray based Gene expression analysis: the real story of cells
k. Case studies: find the bad genes, predict the diseases

Difference between Undergraduate and Graduate Work:
Graduate students are assigned more difficult problems and graded on a different scale than undergraduates.

Syllabus Flexibility: High.

Modification and Approval History:
Initial description …
Revised June 2011 by Jianjun Hu