Course Syllabus: Post-Genomic Analysis (BIOL 5354)

Instructor:
Jianying Zhang, M.D., Ph.D.; Office: B301, Lab: B323; Email: jzhang@utep.edu
Phone: 915-747-6995 (O); 915-747-5343 (L)

Class Hours: W 0130-0420 pm – CRBL 303
Office Hours: T, TR 0230-0330pm

Course Description:
In the genomic era (or post-genomic era, after human genome sequencing has been almost completed), DNA sequencing is increasing our knowledge of the molecular structure of genetic codes from bacteria to man at a hyperbolic rate. Billions of nucleotides and millions of amino acids are already filling the electronic files of the data bases presently available, which contain a tremendous amount of information on the most biologically relevant macromolecules, such as DNA, RNA and proteins. The crucial question is how to select the relevant pieces of information in order to focus the research activity on tractable problems. Intelligent tools are therefore needed to optimise the search. Data mining for sequence analysis in biotechnology has been substantially aided by the development of new powerful methods borrowed from the machine learning approach. The extraction and confirmation of information from entire and partially assembled genome sequences is currently available. This course includes the design and use of DNA arrays, SNP’s and applied proteomics in the identification and verification of expressed genes of interest.

Required Materials

Evaluation
The exercises (Discovery Questions) that accompany each chapter will be given. The exercises encourage students to immediately use their newly acquired knowledge and, thus, by practice, improve retention.

Using articles relating to Post-genomic Analysis, several projects will require you to ascertain the study objectives, study design, technology, data analysis and application. Your paper must be typed and double-spaced. No hand written papers will be accepted. Later papers will receive a 10% deduction in points for each day (including non-class days) they are late. If you absolutely cannot make it to class on the day your paper is due, you may email your assignment to me with an attachment.

Locate three recent articles relating to DNA Microarrays, SNPs or Proteomics research, and do a presentation in our class. Everyone presenting the paper is expected to use Microsoft PowerPoint or Overheads for demonstration purposes.
Grading
Your grade in this course is based on a combination of projects, presentation and participation in class. Grades are based on a straight percentage scale; there is no curve and no +/- grades are awarded. So, an A=100-90%, a B=89.9-80%, a C=79.9-70%, a D=69.9-60%, and F=<60%.

Course Schedule: (this schedule is tentative, it may be changed)

1st week (1/18/2006)
**Dr. Zhang:** Introduction to Post-Genomic Analysis
  (Topic: From DNA to Protein)
  Lab: Preparation of culture medium

2nd week (1/25/2006)
**Dr. Zhang:** Introduction to Post-Genomic Analysis
  (Topic: Biotechnology and Recombinant DNA)
  Lab: Isolation and purification of DNA

3rd week (2/1/2006)
**Dr. Zhang:** Introduction to Post-Genomic Analysis
  (Topic: Molecular Genetics)
  Lab: Isolation and purification of DNA

4th week (2/8/2006)
**Dr. Irwin:** Microarray Analysis of Gene Expression (lecture)

5th week (2/15/2006)
**Dr. Byers:** Microarray Analysis of Gene Expression (lab)

6th week (2/22/2006)
**Dr. Zhang:** Applied Research with DNA Microarrays
  Lab: DNA sequencing and sequence analysis

7th week (3/1/2006)
**Dr. Zhang:** Introduction to SNPs
  SNPs Technology (Methods and Protocols)
  Lab: DNA sequencing and sequence analysis

8th week (3/8/2006)
**Dr. Zhang:**
  SNPs and Cancer
  Lab: Protein purification

9th week (3/15/2006)
**Spring Break (no class)**
10th week (3/22/2006)
**Dr. Zhang**: Introduction to Proteomics
Lab: Protein purification

11th week (3/29/2006)
**Dr. Almeida**: Proteomics (lecture)

12th week (4/5/2006): **no lecture and lab**

**Project and Presentation**

13th week (4/12/2006)
**Drs. Zhang & Almeida**: Proteomics (lab demonstration)

14th week (4/19/2006)
**Dr. Zhang**: Project Presentation

15th week (4/26/2006)
**Dr. Zhang**: Project Presentation

16th week (5/3/2006)
**Dr. Zhang**: Project Presentation
Post-Genomic Analysis: (Lab)

1. **Isolation and purification of DNA**: preparation of culture medium, cell culture, isolation and purification of DNA, DNA gel, etc.
2. **DNA sequencing**: sequencing reaction, sequencing, sequence analysis
3. **Protein purification**: preparation of culture medium, cell culture, protein purification, SDS-PAGE gel, gel transfer, Western blot, etc.
4. **DNA microarray**: lab demonstration
5. **Proteomics**: lab demonstration
INSTRUCTOR: Naijun Sha

OFFICE: Bell Hall 203

PHONE: 747-6844

E-MAIL: naijun@math.utep.edu

WEBPAGE: http://www.math.utep.edu/Faculty/naijun/sha.html

OFFICE HOURS: TR 1:00 - 2:00pm or by appointment

DEADLINE for Automatic W: March 24


Course Description: Statistical analysis of a multivariate response. Multivariate multiple linear regression, principal components, canonical correlation, classification and clustering analysis. Applications with the use of statistical packages will be considered. Prerequisite: STAT 5370 or equivalent, or consent of instructor.

Assignment and Attendance: Homework and data analysis projects will be assigned throughout the semester. You may do the exercises with your partner, but each student must answer the questions individually. ZERO grades will be got for those whose solutions are the exact copies of someone else. Class attendance is required and helpful to decide borderline grades.

Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>30%</td>
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<tr>
<td>Final/Project</td>
<td>40%</td>
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The final grade is based on a scale of 90 – 100 = A, 80 – 89 = B, 70 – 79 = C, 60 – 69 = D, below 60 = F.

References: