

## Course Syllabus

Subject and Course Number: BIOE 507

Title: Advanced Bioinstrumentation

Prepared by: Dr. Rohit Bhargava

Required Texts: Selected publications from the literature. Class Notes

Credit: 4 graduate hours.

Contact Hours: Two 90-minute lectures-discussions per week. Three and a half contact hours per week.

<u>Topics</u>	<u>Contact Hours</u>
1. Bioinstrumentation: Applications in biological research and medicine	2
2. Lifecycle of instrumentation development, FDA regulations	2
3. Introduction to measurements and review of control theory	4
4. Physical sensors and measurements: Density, pressure; Stress, strain and viscosity; Volume and Flow; Vibration; Force; Particle Sizing	2
5. Blood chemistry sensors (electrolytes, O <sub>2</sub> , CO <sub>2</sub> , pH, glucose, serum analyses) and applications	2
6. Electrical sensors and applications (Electrocardiographs, Electroencephalograph, Electromyography)	2
7. Design considerations and measurement tests using antibodies – ELISA	2
8. Control and application to bioanalytical instruments	8
9. Introduction to imaging techniques and principles of tomography	4
10. X-ray and PET	2
11. MRI instrumentation and measurements	2
12. Ultrasound instrumentation and measurements	2
13. Structural and chemical microscopy techniques	2
14. Emerging instrumentation for genomics, proteomics, metabolomics	2
15. Nanobiological measurements and instrumentation, Lab-on-a-chip concepts and microfluidics	4
16. Detector systems and contrast mechanisms	<u>8</u>
Total	50

Grade determination: One midterm (20%), final examination (20%), homework (20%), and course project (40%).