

21 January 2003, Tuesday, Measurement Devices

Lecture 3 Displacement transducers,
Ohmmeters and bridge circuits.
ASSIGNED READING: Chapter 2, pp.44-72

23 January 2003, Thursday, Measurement Devices,

Lecture 4 Measurement of temperature,
Potentiometer circuits.
ASSIGNED READING: Chapter 2, pp.44-72; Class Notes

28 January 2003, Tuesday, Use of Statistical Methods for Measurements,
Statistics and Instruments,

Lecture 5 Statistical processing of signals.
ASSIGNED READING: Chapter 1, pp. 26-35; Class Notes

30 January 2003, Thursday, Principles of Signals,

Lecture 6 Fundamentals of time and frequency domain analysis,
Analog and digital signals, and converters.
ASSIGNED READING: Chapter 1, pp. 26-35

4 February 2003, Tuesday, Data processing systems

Lecture 7 Data acquisition and storage systems,
Recording and display systems.
ASSIGNED READING: Chapter 7, pp. 287-308

6 February 2003, Thursday, Mechanical measurements

Lecture 8 Measurement of force,
Pressure transducers
Direct measurement of blood pressure.
ASSIGNED READING: Chapter 7, pp. 308-328

11 February 2003, Tuesday, Mechanical measurements, continued

Lecture 9 Indirect measurement of blood pressure
Sensing heart sounds
Measurement of flow
Thermal flow measurement
ASSIGNED READING: Chapter 8, pp.332-355

12-14 February 2003, Winter Carnival

18 February 2003, Tuesday, Measurement of volume and flow

Lecture 10 Electromagnetic flow sensors
Doppler flow measurement
Plethysmography
ASSIGNED READING: Chapter 8, pp.355-368

20 February 2003, Thursday, MIDTERM EXAM I (Lectures 1-9 through blood pressure)

25 February 2003, Tuesday, Electrical impedance of biologic tissue

Lecture 11

Review of concept of electrical impedance
Impedance bridge circuits
Determining biological events by electrical impedance
Detection of venous occlusion
ASSIGNED READING: Review impedance in circuits book
Chapter 4, pp. 121-125, 138-146, 164-171;

27 February 2003, Thursday, Measurement of biopotentials

Lecture 12

Review of physics of electric fields
Biological origin of electrical potentials,
Electrochemical electrodes,
ASSIGNED READING: Chapter 5, pp. 183-211

3-7 March 2003 (Spring Break)

11 March 2003, Tuesday, Measurement of biopotentials, continued

Lecture 13

Biopotential electrodes,
Microelectrodes.
ASSIGNED READING: Chapter 5, pp. 211-226

13 March 2003, Thursday, Biopotential amplifiers

Lecture 14

Examples of biopotential electrodes and signals,
Review of operational amplifier circuits.
ASSIGNED READING: Chapter 3, pp. 89-115

18 March 2003, Tuesday, More biopotential amplifiers

Lecture 15

The instrumentation amplifier,
The electrocardiograph,
The electromyograph.
ASSIGNED READING: Chapter 4, pp.146-151
Chapter 6, pp. 233-250

20 March 2003, Thursday, Still more biopotential amplifiers

Lecture 16

Noise and interference in biopotential measurement,
Cardiotachometers.
ASSIGNED READING: Chapter 6, 250-266

25 March 2003, Tuesday, Biomedical signal processing

Lecture 17

Filtering,
Averaging.
Integrating.
ASSIGNED READING: Chapter 6, 267-281

27 March 2003, Thursday, Optical sensing

Lecture 18

Review of physics of light,
Light detecting devices,
Elementary biomedical applications
ASSIGNED READING: Chapter 2, pp. 72-85

1 April 2003, Tuesday, Electrochemical sensors

Lecture 19 Nernst equation,
Potentiometric sensors,
Measurement of pH
Measurement of CO₂
ASSIGNED READING: Chapter 10, pp. 440-450

3 April 2003, Thursday, More electrochemical sensors

Lecture 20 Amperometric sensors
Measurement of oxygen.
ASSIGNED READING: Chapter 10, pp. 450-476

8 April 2003, Tuesday, Clinical lab instrumentation

Lecture 21 Blood gas measurement,
Bioanalytical sensors.
Glucose sensors
ASSIGNED READING: Chapter 10, pp 477-482, 486-502

10 April 2003, Thursday, MIDTERM EXAM II (Lectures 10-20)

15 April 2003, Tuesday, Chemical sensors

Lecture 22 Colorimetric sensing,
The pulse oximeter.
ASSIGNED READING: Chapter 9, pp. 470-472,
Chapter 10, pp. 507-515

17 April 2003, Thursday, Measurement of pulmonary variables

Lecture 23 Measurement of lung volumes,
Measurement of air flow,
Breathing and apnea monitoring.
ASSIGNED READING: Chapter 9, pp. 390-406

22 April 2003, Tuesday, Instrumentation for biomaterials studies

Lecture 24 Tissue characterization,
viscoelastic properties.
Biocompatibility
ASSIGNED READING: To be assigned

24 April 2003, Thursday, Instrumentation in molecular biology, by Dr. Orhan Soykan

Lecture 25 DNA sequencing technologies, Molecular Diagnostics,
Polymerase chain reactors, Blotting techniques
.
ASSIGNED READING: To be assigned

29 April 2003, Tuesday, Instrumentation in cellular biology, by Dr. Orhan Soykan

Lecture 26 Fluorescence Assisted Cell Sorting,
Recombination techniques, Bioreactors
.
ASSIGNED READING: To be assigned

1 May 2003, Thursday, Instrumentation in critical care medicine

Lecture 27

Cardiac monitoring,
Neonatal intensive care
Fetal monitoring
ASSIGNED READING: To be assigned

6 May 2003, Tuesday, General course review

Lecture 28

FINAL EXAM (Comprehensive): TBD

Required Background Knowledge:

University Level Physics, Electric Circuits, Introductory Anatomy and Physiology

Required Textbook:

Medical Instrumentation: Application and Design

Edited by John G. Webster,

John Wiley & Sons; ISBN: 0471153680; 3rd edition (August 1997)

Price: US\$103.95 at Amazon.Com
