INTRODUCTION TO BIOMEDICAL ENGINEERING

PART III: Biomedical Signal Processing (Six Hours).

Instructor: Prof. Ju-Hong Lee. (Rm 517, Tel: 23635251 ext. 517, email: juhong@cc.ee.ntu.edu.tw)

Textbook: Eugene N. Bruce, "*Biomedical Signal Processing and Signal Modeling*", John Wiley & Sons, Inc., New York, 2001.

Reference: Robert B. Northrop, "*Signals and Systems Analysis in Biomedical Engineering*", CRC Press LLC, 2003.

COURSE OUTLINE:

(I) Introduction to Biomedical Signals:

- **Signals from Physiological Systems ─ ECG, EEG, EGG, EMG, ERG, etc.**
- **Signals from Man-Made Instruments ─ CW Doppler Ultrasound signals, MRI signals, Positron Emission Tomography (PET) signals, etc.**
- **Continuous-Time (CT) and Discrete-Time (DT) Signals.**
- **Purposes of Processing Biomedical Signals.**

(II) Introduction to Linear System Theory:

- **Properties of Operators and Transformations.**
- **The Impulse Response of a Linear System.**
- **Convolution Form of an linear shift-invariant (LSI) System.**
- **Relation to Signal Processing.**

- **Frequency Response of Discrete-Time Systems.**

(III) Modeling CT Signals as Sum of Sine Waves.

- **Orthogonal Functions and Sinusoidal Basis Functions.**
- **Relationship of CT Fourier Transform (CTFT) to Frequency Response.**

(IV) Modeling DT Signals as Sum of DT Sine Waves.

- **The DT Fourier Series.**
- **Fourier Transform of DT signals.**
- **Sampling Process and Sampling Theorem.**

(V) Noise Removal and Signal Compensation.

- **Linear Digital Filters.**
- **Digital Filtering of Biomedical Signals.**