601 BIO-MEDICAL ENGINEERING

Syllabus for Ph.D Eligibility Test – 2014:

Bio-Medical Instrumentation: General characteristics of medical instruments. Origin of bioelectric signals and their characteristics Bio-Potential electrodes-principle, types and applications, Transducers for biomedical applications, Characteristics of amplifiers and recorders for recording bio-potential signals. Design of bio-potential amplifiers.

Biomedical Equipment - Cardiovascular equipment: Defibrillators and pacemaker-working principles, classification, types of electrodes. Precautions, ECG machine-ECG leads, recording system, frequency response. Intra Aortic Balloon Pump-Principle and applications, Artificial hearts valves, types and performance.

Surgical Equipment: Electrosurgical unit-principle and types of electrodes, lasers-Interaction with tissue and its effects, Advantages of Laser surgery.

Other equipment: EEG and EMG recorders. Impedance pneumograph, ventilators, Audiometer, Ophthalmic instrumentation, imaging equipment.

Biomechanics: Mechanical properties of bone and soft tissues, viscoelastic models, Analysis of forces in Joints. Cardiovascular mechanics. Models of lungs ventilation and glucose dynamics. Characteristics and applications of biomaterials.

Biological Control Systems: Feedback control systems, Time and frequency domain analysis, stability analysis. Fundamentals of biological control systems, body temperature regulation, blood pressure control, eyeball movement control.

Bioelectricity : Cell membrane, action potential, strength-duration curve, excitability of different cells. Nerve conduction in myelinated and unmyelinated nerve fibres, nerve conduction velocity measurement.

Biomedical signal processing ECG-QRS detection, arrhythmia detection, various data compression techniques. EEG-detection of alpha, beta, gamma waves, spikes and spindles. Sleep EEG analysis.