

**University of Pune**  
**Ph.D. Course work in School of Basic Medical Sciences**

**Course work: Three courses**

- 1. Each course will be of 5 credits and equally assessed.**
- 2. A course 103 will be handled by concerned guide**
- 3. Director will keep the record for awarding Grade points and issuing of the certificate.**

**Ph.D SBMS 101: Research Methodology (5 Credits)**

**Mode of study includes: Assigning the topic to students based on their basic background and presentation in the form seminar which will be followed by discussion and submission of the write-up. This will be evaluated by group of teachers. There will not be any formal classroom teaching.**

*Identification of a Research Topic  
and Problems*

*Reference collection from SCOPUS and various internet sources*

*Hypothesis and Research Design*

*Art of writing Thesis and a Research Paper*

**Introduction to Biostatistics:** Biostatistics and Biometry, Aims of Biostatistics, Applications of Biostatistics, Role of Biostatistics in Modern Research

Classification of data and Frequency distribution,

**Representation of Biometric Data:** Presentation of Data, Graphic Representation of Data, Histogram, Pictogram ,

**Central Tendency :**Mean, Median and Mode.

**Analysis of variance (Anova)**

**Test of Hypothesis and Test of significance**

**Introduction to Analyzing software**

Introduction to **Origin** Software,

Introduction to **ImajeJ** Software.

**Connecting Laboratory Instruments to computers:** Types of Interface, Analog Interface, and Digital I/O Interface

### **Ph.D SBMS 102: Biomedical Techniques (5 Credits)**

**Microscopy:** Optical microscopy-Theory of microscopy, geometrical and physical optics, lenses and aberrations, focal length. Resolution, magnification, numerical aperture, objectives, eyepieces, condenser

**Principle, optics and application of the following:** Dark-field microscopy, Phase contrast microscopy, Interference microscopy, Polarizing microscopy, Fluorescence and confocal microscopy

**Electron Microscopy:** Introduction to electron microscopy. A comparison with optical microscopy(SEM,TEM)

**Spectroscopy :** Rotational, Vibrational and UV-visible spectroscopy of molecules.

Structural studies of biomolecules using absorption of ultraviolet light. Absorption of polarized light. Instrumentation and application of microspectrophotometry UV and polarized UV-microspectrophotometry, atomic absorption spectrophotometer. Raman Spectroscopy, Plasmon Resonance spectroscopy, Magnetic Resonance spectroscopy

**Biomedical Recorders:** Bioelectric Potentials, ECG, EEG, EMG, Electrocardiography, Block diagram of electrocardiograph; The ECG leads, effects of artifacts on ECG recording, Electroencephalography; Block diagram of EEG, Electrode locations, The normal EEG, clinical value of the EEG. Electromyography; Block diagram of EMG

**Laser:** Introduction to laser, principle of operation of laser, Different types of emissions of. Radiation, Basic components of Laser instruments. Biophysics of laser, laser-tissue interaction, Different types of laser; biomedical applications in surgery and therapy of Pulsed Ruby laser, Nd-YAG Laser, Helium- Neon laser, CO<sub>2</sub> laser.

**Radiation Biology:** Types of Ionizing and Non-Ionizing radiation(Gamma,uv,X-ray, Microwaves) ,Effects of Ionizing and Non-Ionizing radiation, Radioactivity, Radioisotopes and their Biomedical applications, Dosimetry,

**Centrifugation and Gas Chromatography:** Definition and basics, Gas Chromatography, Liquid Chromatography, TLC, HPLC, PAGE, Electrophoresis techniques

### **Ph.D SBMS 103: Special Course (5 Credits)**

This will be monitored by the respective guide and students can obtain credits as follows.

Two Posters/papers presentation in National conferences: **1 credit**

One Posters/papers presentation in International conferences: **1 credit**

Attending workshop which is of minimum 10 days duration: **1 credit**

Training in the laboratory outside the department at least of 15 days: **1 credit**

Members of the organizing committee of any in National/ International conferences: **1 credit**

### **Recommended Books**

- 1. Handbook of Biomedical Instrumentation (Second Edition) by R.S. Khandpur (Tata McGraw Hill)**
- 2. Essentials of Biophysics by Narayanan, New age publications.**
- 3. Radiation Biophysics by Edward Alphan, Prentice Hall Advance Refers.**
- 4. Medical Physics by John R.Cameron, J.G. Skofronick ,John Willey and Sons, International Publications**
- 5. Fundamentals of Biostatistics by Veer Bala Rastogi, Ane's Student Edition**