

Educational Objectives:

- Understand cancer statistics and the descriptive epidemiology of cancer;
- Understand known risk factors and gaps in knowledge for the major cancers;
- Understand the biology of cancer;
- Apply methods in the design, conduct, and analysis of cancer research studies;
- Apply critical thinking in the review of projects and publications in cancer biology;
- Appreciate the multidisciplinary aspect of cancer including the contributions of basic sciences, clinical medicine and the social sciences to the understanding of cancer biology and progression.

Course Outcomes:

The aim of the course is to provide comprehensive understanding of the molecular Biology of cancer. The students will acquire an in depth understanding of the underlying biology and clinical challenges of the disease. The course will enable the students to describe hallmarks of cancer, role of dysfunction in cell cycle regulation in cancer development, understanding of the mechanism by which cancer cells escape apoptosis and steps leading to metastasis. Thus the student will be able to get a comprehensive understanding of current concepts in cancer biology.

Course Contents:

- History & Introduction
 - History of Cancer Detection
 - Stages of Tumor Progression
 - Initiators and Promoters
 - Carcinogens
- Carcinogens: Cancer Causing Substances
 - List of Carcinogens and the Cancers They Cause
 - Environmental Agents and Cancer Development
 - Viruses and Bacteria that Cause Cancer
 - Chronic Inflammation and Cancer Development
 - The Two-Stage Model of Cancer Development
 - Cancer Initiation, Promotion and Progression
 - What are Cancer Stem Cells

- An Introduction to Cancer Treatments
- Cancer Stem Cells and Treatment
- Introduction to Cancer Prevention
 - Cancer Detection and Diagnosis
 - Introduction to Cancer by Type
 - Introduction to How Cancer Spreads
- Introduction to Characteristics of Cancer Cells
 - Changes in Physical Properties of Cancer Cells
 - 1Growth without 'GO' Signals
 - Failure to Respond to 'STOP' Signals
 - Unlimited Number of Cell Divisions
 - Avoidance of Cell Death
 - Angiogenesis
- Introduction to Metastasis
 - Formation of Metastases
 - Routes of Metastasis
 - Spread of Cancer through the Lymphatic System
 - The Lymphatic System
 - Organ Targeting: Anatomic vs Seed & Soil Models
 - The Anatomic Model
 - The Seed and Soil Hypothesis
 - How Metastases Form New Tumors (Colony Formation)
 - Obstacles to Colony Formation
- Barriers to Metastasis
 - Barriers to Metastatic Cancer Cell Growth
 - Treatments that Target Metastasis (Metastatic Suppressors)
 - Anti-angiogenesis Therapy
- Introduction to the Tumor-Host Interactions
 - Overview of the Tumor Microenvironment
 - Conditions within the Tumor Microenvironment
 - Inflammatory Cells and Cancer
 - Matrix Metalloproteinases and Cancer

Recommended Books:

1. **Cancer biology** by : Raymond W Ruddon-2009 -4rth Edition

2. **The Biology of Cancer** by Robert A Weinberg 2007