

An Introduction to Cancer Biology

Module I	Subtopics	Faculty assigned
The Nature of Cancer [Cellular and molecular basis of cancer]	<ol style="list-style-type: none"> 1. Tumor arises from normal tissues <ol style="list-style-type: none"> a. Primary tumor b. Benign tumor c. Malignant tumor d. metastases 2. Tumor arises from many specialized cells throughout the body <ol style="list-style-type: none"> a. Epithelia b. Endothelia c. Carcinomas d. Sarcomas 3. Cancer develops progressively <ol style="list-style-type: none"> a. Hyperplasia b. Metaplasia c. Polyps, papillomas, warts 4. Clonal nature of tumors <ol style="list-style-type: none"> a. Monoclonal b. Polyclonal c. Lineage tracing 5. Agents that can induce cancer <ol style="list-style-type: none"> a. Physical b. Chemical c. Biological(viruses) 6. Growth factors, receptors and cancer <ol style="list-style-type: none"> a. Normal Growth factors b. Src or EGF- TK based signaling c. Altered GF receptor can function as an oncoprotein d. Nuclear receptors, Integrin receptors e. Ras protein 	

Reference	Chapters 2 and 5 of The Biology of Cancer- Robert Weinberg	
Labs/ Visits		

Module II	Subtopics	Faculty assigned
The Genetics of Cancer [Gene expression, cellular oncogenes, tumor suppressor genes]	1. Gene Expression patterns a. Histone Modifications b. Transcription factors c. Mutations and cancer d. Heritable gene expression e. Gene cloning techniques to study normal and malignant cells 2. Cellular Oncogenes a. Proto-oncogenes b. Retrovirus associated oncogenes c. The myc oncogene d. Mechanisms involved e. Structural changes in proteins 3. Tumor Suppressor genes a. The cancer phenotype: recessive nature b. The retinoblastoma tumor: important insights c. Mitotic recombination d. Loss of heterozygosity e. Familial cancers	
Reference	Chapters 1,4and 7 of The Biology of Cancer- Robert Weinberg	
Labs/ Visits/ Hands- On		

Module III	Subtopics	Faculty assigned
Tumorigenesis [the journey of cancer from tumor to metastases]	1. Cell Immortalization a. Normal cell population, growth pattern b. How cancer cells deviate from this c. Generational clock 2. Cell – physiologic stresses a. Onset of senescence b. Cumulative oxygen demand c. Effect of senescence on cellular biochemistry d. Crisis 3. Role of Telomeres a. Significance of telomere b. If functional telomere is lost c. Mega chromosome d. Mitosis of a dicentric chromosome 4. Multi-step tumorigenesis a. Human cancers develop progressively b. Histological evidence of multistep process c. Cells accumulate genetic and epigenetic alterations 5. Invasion and Metastasis a. How a primary tumor evolves, cells move out b. Invasion-metastasis cascade c. Intravasation d. Extravasation e. Colonization f. EMT	
Reference	Chapters 10,11and 14 of The Biology of Cancer- Robert Weinberg	
Labs/ Visits/ Hands- On		
		Faculty assigned

Module IV	Subtopics	
Tumor immunology and therapy [how immune system functions in cancer, treatment patterns]	4.1 Crowd control by immuneSystem a. How immune system tries to protect: HMI, CMI b. Adaptive immune response- antibodies and cytotoxic cells c. Innate immune response 4.2 Immune-tolerance a. self and non-self b. regulatory T cells c. Tumor antigens 4.3 Immune-surveillance a. Theory-allograft rejection b. histocompatibility c. Immune editing d. human immune system in warding off cancers e. escape from surveillance 4.4 The rational treatment of cancer: a. surgery, b. radiotherapy, c. Chemotherapy d. Differentiation, cell cycle checkpoints and apoptosis in cancer therapy 4.5 Recent advances a. Immunotherapy b. Combination therapy	
Reference	Chapters 15 and 16 of The Biology of Cancer- Robert Weinberg	
Labs/ Visits/ Hands- On		
Course Evaluation		