GUJARAT TECHNOLOGICAL UNIVERSITY
Master of Science (Integrated-Biotechnology)
Semester: 2
Subject Name: Cancer Biology
Subject Code: 1320404

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	0	4	70	30	0	0	100

Prerequisite:
Students are expected to have knowledge about molecular and cell biology in the preceding classes or courses.

Rationale:
Cancer is uncontrolled proliferation of living cells. This course will provide knowledge on cellular and molecular basis of cause of cancer. Understanding the molecular pathway involved in it will help in the development of novel methods of diagnosis and drug for treatment of diseases.

Course Content:

Unit No.	Content	No. of Hours	Weightage (%)
1	**Cell cycle and molecular mechanism of carcinogenesis** Cell cycle and molecular players involved in the cell cycle. Deregulation of cell cycle and causes for deregulation of cell cycle. Role of an oncogene, proto-oncogene, tumor suppressor proteins, and on coviruses in cancer. Cancer and its types. Molecular mechanisms of mutagens such as Chemical carcinogen and radiation. Types of carcinogen and their mode of action with an example.	15	25
2	**Apoptosis** The apoptotic mechanism, altered pathways in cancer cells that can evade apoptosis. Pathways are regulating tumor initiation and/or its progression.	6	10
3	**Genomic instability** Types of genomic instability: instability due to micro and mini satellite sequence, Loss of DNA repair mechanisms, Dysfunction of telomerase. Chromosomal aberrations that cause cancer. Single nucleotide polymorphisms and cancer. Tumor angiogenesis, Clinical significance in invasion, Three-step theory of invasion, Proteinases, and tumor cell invasion.	10	17
4	**Cancer stem cells and models to study cancer** The stem cell theory of cancer, tumor heterogeneity, Origin of cancer stem cells, and controllingcancer by targeting cancer stem cells Cell culture techniques: MTT assay, colony-forming assay, and matrigel assay. Animal models	15	25

	used to study cancer: Nude mice, Transgenic and knockout mice, Cre mice, and patient-derived xenografts (PDXs).		
5	**Cancer Therapeutics and Diagnosis** Detection of Cancers, Prediction of aggressiveness of cancer, Advances in cancer detection. Different forms of therapy, Chemotherapy, Radiation Therapy, Targeted therapy: Monoclonal antibody, and kinase blockers.	14	23
	Total Hours:	60	

Textbook:

1. Robert A Weinberg, The Biology of cancer, 2nd Edition 2014
2. Molecular Biology of Human Cancers, Wolfgang Arthur Schulz, 2007

Reference Books:

1. The Cell – A Molecular Approach, Geoffrey M. Cooper And Robert E. Hassman. 3rd Edition, 2004, ASM Press, Sinauer Associates, Inc.ISBN:0-87893-214-3.

Course Outcomes:

No.	Course Outcomes	RBT Level*
1	Infer cancer causing mutations and specific therapeutic targets	RM, UN
2	Compare the biological treatment processes and development of suitable technologies.	RM, UN
3	Determine the challenging sides of using cancer models in cancer research	RM ,UN,AP

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

List of Laboratory/Learning Resources Required

1. https://www.coursera.org/learn/cancer

2. https://ocw.mit.edu/courses/7-342-cancer-biology-from-basic-research-to-the-clinic-fall-2004/pages/syllabus/