Course contents for Cancer Biology and Therapeutics for MSc Biotechnology

1. **Faculty**: FLSB
2. **Course Code**: LSB621
3. **Course Title**: Cancer Biology and therapeutics
4. **Number of Credits**: 3 (3L+0T+0P)
5. **Course objectives**:

The goal of this course is to understand basic cellular and molecular mechanisms of cancer development with an emphasis on what the basic science of normal cells and molecular biology can teach us about how regulation goes wrong in cancer cells. These molecular events include unregulated proliferation, evasion of cell death, and metastasis. This course will describe the factors that contribute to the cancer development and describe the cancer treatment and currently available therapeutic treatments.

6. **Minimum prerequisites for taking this course, if any**: Master level of Molecular Biology, Cell Biology, Genetics, Biochemistry and Molecular Biology
7. **Course structure with units, if applicable**:

The following topics will be covered as part of the course:

a. **Growth factors, receptors and cancer cell signaling**: Growth factors, Ras Signaling pathway including, MAPK, PI3K and Ral GDS, deregulation of TGF-β, NOTCH, GPCR, NF-KB, Integrin Signaling pathways and their role in cancer

b. **pRB and control of cell cycle clock**- Cell cycle clock, role of pRb in cell cycle regulation, role of cyclin dependent kinases and their inhibitor in cell cycle clock, role of transcription factor E2F in cell cycle, role of myc and TGF beta in cell cycle regulation basically focused in deregulation of cell cycle in cancer by above mentioned factors.

c. **P53 and apoptosis**- The guardian angel- Basic concept of P53, role of P53 in tumor progression, different pathways involved in apoptosis.

d. **Steps of tumorigenesis**- Concept how a tumor progression happened in multi-step, Darwinian model of multistep tumorigenesis, Tumor Stem cell concept of multistep tumorigenesis, Role of chronic inflammation in multistep tumorigenesis.

e. **Conventional cancer therapeutics**: Chemotherapy, Radiation therapy, Surgery; Photodynamic therapy; Side-effects and management- myelosuppression, stem cell transplant etc.

f. **Targeted cancer treatments** – Biomarkers and patient stratification, Monoclonal antibodies, Hormone therapy and small molecule inhibitors – kinase inhibitors, BCR-ABL, PARP inhibitors etc; Drug Delivery systems in cancer - nanomedicine

g. **Immunotherapy**- Introduction, Immunotherapy with checkpoint inhibitors, Targeted treatments and immunotherapies for haematological cancers including cell therapies-CART-cell therapy

h. **Advances in therapeutics**: Genetic therapy, Neoantigens and cancer vaccines

8. **Reading suggestions**:

a. The Biology of Cancer by Robert A. Weinberg
b. Introduction to Cancer Biology by Robin Hesketh
c. Cancer Biology- Ramond Ruddon
d. Journal of Cancer Research
e. Journal of Oncogene
f. Journal of Carcinogenesis Cell

9. **Evaluation:**

Theory: Mid-semester Written Examination: 40% Marks

End-semester Written Examination: 40% Marks

Quiz / Assignment/Presentation (oral / poster)/other: 20% Marks