SS874 INTRODUCTION TO RADIATION BIOLOGY 4-0-0 4

Course Objective

- This course will provide a brief overview of the principles of Radiation interaction with Biology. The goal for this course is to introduce the students to the field of Radiation Biology, where radiation physics solves biological problems associated with cancer.

Course Outcomes
At the end of the course students will be able to

CO 1	**Understand the fundamentals of radiation absorption, cell survival curves and the effects of radiation in different cycles of cellular evolution.**
CO 2	**Understand the biological and enzymatic processes that occur after the radiation interaction with the tissues and their relation with Linear Energy Transfer and Relative Biological Effectiveness.**
CO 3	**Understand the short term and long term effects of radiation on human body, embryo and fetus and the concepts of cancer biology and dose response relationship for Model Normal Tissues.**
CO 4	**Understand the clinical response of cell, tissue and tumor to radiation absorption and the different parameters involved in the cell recovery process after irradiation.**
CO 5	**Understand the working of radio-protectors and radio-sensitizers.**

Skills

- **Students will acquire the skills of Mathematical modelling, Analysis and Simulation of biological functions of cells, tissues and organs in terms of structure and behaviour of biological molecules.**

Syllabus

Unit 1:
History of radiation injuries in humans, The Physics and Chemistry of Radiation Absorption, Cell Survival Curves and Target Theory, Radio-sensitivity and Cell age in the Mitotic Cycle.

Unit 2:
Repair of radiation Damage, Radiation injury to DNA, Free radical formation, Chromosomal damage and repair**,** Fractionated Radiation and Dose rate Effect. The Oxygen effect and Re-oxygenation, Linear Energy Transfer and Relative Biologic Effectiveness

Unit 3:
Acute Radiation Syndrome, Radio-protectors and Radiation Carcinogenesis, Heritable Effects of Radiation, Effects of Radiation on the Embryo and Fetus, Radiation Cataractogenesis, Cancer Biology and Dose-Response Relationships for Model Normal Tissues

Unit 4:
Clinical Response of Normal Tissues and Model Tumor Systems, Cell, Tissue, and Tumor Kinetics: Cell recovery processes, Cell cycle sensitivity, Time, Dose, and Fractionation in Radiotherapy

Unit 5:
Radio-protectors and radio-sensitizers.

Project:
Project on Radiobiology modelling

Text book:

1. *Radiobiology for the Radiologist, by Eric J. Hall and Amato J. Giaccia, 8th Edition, Wolters Kluwer Publisher.*

References:

1. *The Physics of Radiology and Imaging, by K Thayalan 1st Edition, Jaypee Brothers Medical Publishers.*
2. *Essentials of Radiology, by Fred A Mettler, 4th Edition, Elseiver*

Evaluation Pattern

Assessment	Internal	End Semester
Periodical 1	15	
Periodical 2	15	
*Continues Assessment (CA)	20	
End Semester		50