



**MANGALORE UNIVERSITY**  
**DEPARTMENT OF BIOSCIENCES**  
**MSc BIOTECHNOLOGY**

**BTS 455**

**RADIATION BIOLOGY (SOFT CORE COURSE) Hours 40**

**Course outcome**

Mangalore University being endowed with radiation related centres, it is apt that there is a course on Radiation biology on offer which is very unique and will provide the following:

- An introduction to types, sources and measures of radiation
- **Training in laboratory practices in radiobiology laboratory**
- Understand use of radioisotopes and radiotechniques
- Link between living cells/tissues and radiation including radiation-related damage and use in therapeutics
- Exposure to research tools and techniques using radiation and radioactive isotopes

**UNIT I (13 hrs)**

Electromagnetic radiation: Ionizing and non-ionizing radiation. Radiation sources: Natural and artificial sources. Radioactivity: units of radiation, different types of radiation, radioactive decay, half-life, biological half-life and mean life. Radiation detectors and monitors; GM and Scintillation counters. Radiation exposure and dose, absorbed dose, equivalent dose, effective dose, committed equivalent dose, collective equivalent dose, biological effectiveness, tissue equivalence.

**UNIT II (13 hrs)**

Radioisotopes: **Good Laboratory Practices in a radioisotope laboratory; Safe-handling of radioisotopes with special emphasis on isotopes used in biotechnology  $^{32}\text{P}$ ,  $^{35}\text{S}$ ,  $^{14}\text{C}$ ,  $^3\text{H}$ ,  $^{125}\text{I}$ . classification of radioisotope laboratories, units of radiation dose, measuring devices.** Applications of radiation in medicine, industry, agriculture. Diagnostic techniques using radioisotopes and radiotracers, Cancer therapy, autoradiography techniques, gamma knife radiosurgery, radioimmunoassay (RIA) and immunoradiometric assay (IRMA).

**UNIT III (14hrs)**

Mechanism of direct and indirect action of radiation at cellular level. Nature of radiation damage at molecular, subcellular and cellular level. DNA damage and chromosomal aberrations. Mitotic catastrophe. Radiation damage: Lethal and sublethal damage, Cell survival curves, Effect of different radiation species and radiation dose/dose rate. Radiation effects on important organs of the human body: deterministic and stochastic effects; possible recovery pathways.

**References**

- 1) Radiation Biophysics – EL Alpen, Academic Press, 1997
- 2) Radiation Biology: Handbook for teachers and Students, IAEA, online
- 3) Basic and Clinical Radiobiology – Joiner M. and van der Kogel A. (ed) UK, online
- 4) Nuclear and Radiochemistry. Friedlander G., Kennedy JW., Macias ES., et al John Wiley and sons., 1981
- 5) Principles and Techniques of Biochemistry and Molecular Biology. Wilson K. and Walker J. (Eds.) 6th Ed., Cambridge Univ. Press., 2005