



# 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