

## PHY 677 - Radiation Protection and Dosimetry

Course Code & Number	Course Name	C.H.	Lec.	Lab.	Tut.
PHY 677	Radiation Protection and Dosimetry	4	4	0	0

### Syllabus

**Radiation Dosimetry:** Quantities and units, Exposure, Absorbed dose, Dose equivalent, Measurement of exposure, Free-air ionization chamber, The air-wall chamber, Measurement of absorbed dose, Measurement of x- and gamma-ray dose, Neutron dosimetry, Dose measurements for charged-particle beams, Determination of LET, Dose calculations, Alpha and low-energy Beta emitters distributed in tissue, Charged-particle beams, Point source of gamma rays, Neutrons, Other dosimetric concepts and quantities, Kerma, Microdosimetry, Specific energy, Lineal energy.

**Chemical and Biological Effects of Radiation:** Time frame for radiation effects, Physical and prechemical changes in irradiated water, Chemical stage, Examples of calculated charged-particle tracks in water, Chemical yields in water, Biological effects, Sources of human data, The life span study, Medical radiation, Radium-dial painters, Uranium miners, Accidents, The acute radiation syndrome, Delayed somatic effects, Cancer, Life shortening, Cataracts, Irradiation of mammalian embryo and fetus, Genetic effects, Radiation biology, Dose-response relationships, Factors affecting dose response, Relative biological effectiveness, Dose rate, Oxygen enhancement ratio, Chemical modifiers, Dose fractionation and radiotherapy.

**Radiation-Protection Criteria and Exposure Limits:** Objective of radiation protection, Elements of radiation-protection programs, The NCRP and ICRP, NCRP/ICRP dosimetric quantities, Equivalent dose, Effective dose, Committed equivalent dose, Committed effective dose, Collective quantities, Limits on intake, Risk estimates for radiation protection, Current exposure limits of the NCRP and ICRP, Occupational limits, Nonoccupational limits, Negligible individual dose, Exposure of individuals under 18 years of age, Occupational limits in the dose-equivalent system, The "2007 ICRP recommendations", ICRU operational quantities, Probability of causation.

**External Radiation Protection:** Distance, Time and shielding, Gamma-ray shielding, Shielding in X-Ray installations, Design of primary protective barrier, Design of secondary protective barrier, NCRP report No. 147, Protection from beta radiation, Neutron shielding.

### References

- J.E. Turner, Atoms, Radiation, and Radiation Protection, 3rd Edition, Wiley-VCH Verlag GmbH & Co., KGaA, Weinheim, 2007.
- E.B. Podgorsak. Radiation Physics for Medical Physicists, Springer, 2006.
- J.E. Martin, Physics for Radiation Protection, 2nd Edition, Wiley-VCH, 2006.

