**DNA DAMAGE AND REPAIR** **CREDIT HOURS 2+1**

**LEARNING OUTCOMES:**

**The students will be able to:**

1. The types of DNA damages and their repair theories
2. The DNA damage as a key factor in the development and evolution of cancer cells

**COURSE CONTENTS:**

Introduction; Radiation (ionizing and non-ionizing) as damage inducing agents. DNA, the critical site for damage and interaction. Biological consequences of damage. Inactivation of biological systems: bacterial cells and bacteriophages by UV radiations. Post-irradiation macromolecular system. Chemicals and biological agents as damage inducers. Exogeneously and endogeneously induced base modifications and their biological consequences. Repair and Restoration of DNA damages: photo-enzymatic restoration and dealkylation, excision repair processes, mismatch repair, tolerance mechanism, conditioned repair phenomenon (phenomenology and genetic control of SOS functions, adaptive responses to DNA alkylation and oxidative stress. Environmental and physiological factors influencing recovery phenomenon viz. Liquid holding recovery, thermal and UV reactivation. Relevance of inducible repair to carcinogenesis.

**PRACTICALS:**

1. Screening of mutagenic agents by AMES test and comet assay
2. To determine the effect of radiation on prokaryotes and eukaryotes
3. Screening of carcinogenic agents by use of indicator cell lines

**RECOMMENDED BOOKS:**

1. Hanaoka, F., & In Sugasawa, K. 2016. DNA replication, recombination, and repair: Molecular mechanisms and pathology. Tokyo : Springer
2. Hausen, H. Z. 2006. Infections Causing Human Cancer, John Willey and Sons, N.Y.
3. Holland, E.C. 2004. Mouse Models of Human Cancer, John Wiley and Sons, N.Y.
4. Howe, H. 2007. Gene Cloning and Manipulation, Cambridge University Press, N.Y.
5. Kornberg, A. and Baker, T. A. 2005. DNA Replication, 2ndEdition, University Science Books, Sausalito, C.A.
6. Kumar, M. 2015. Senescence, DNA damage and repair in COPD. Saarbrücken: LAP LAMBERT Academic Publishing.
7. [Nickoloff](http://www.amazon.com/exec/obidos/search-handle-url/index=books&field-author=Nickoloff%2C%20Jac%20A./002-0005045-4235257) , J. A. and [Hoekstra](http://www.amazon.com/exec/obidos/search-handle-url/index=books&field-author=Hoekstra%2C%20Merl%20F./002-0005045-4235257), M. F.1998. DNA Damage and Repair : DNA Repair in Prokaryotes and Lower Eukaryotes, Humana Press, N.J.
8. [Nickoloff](http://www.amazon.com/exec/obidos/search-handle-url/index=books&field-author=Nickoloff%2C%20Jac%20A./002-0005045-4235257), J. A. and [Hoekstra](http://www.amazon.com/exec/obidos/search-handle-url/index=books&field-author=Hoekstra%2C%20Merl%20F./002-0005045-4235257), M. F. 2001.DNA Damage and Repair: Advances from Phage to Humans, Humana Press, N.J.
9. [Simic](http://r1.us.rmi.yahoo.com/rmi/http://shop.barnesandnoble.com/booksearch/results.asp/rmivars%3ftarget=_top?userid=409RIJKS9U&mscssid=0JNTK1GAUEW59KC45M39FTSFTEE0FJ65&sourceid=00033868505897959331&bfdate=03%2D26%2D2002+01%3A16%3A26&author_last=Simic&author_first=Michael+G%2E&match=exact&options=and), M. G., [Grossman](http://r1.us.rmi.yahoo.com/rmi/http://shop.barnesandnoble.com/booksearch/results.asp/rmivars%3ftarget=_top?userid=409RIJKS9U&mscssid=0JNTK1GAUEW59KC45M39FTSFTEE0FJ65&sourceid=00033868505897959331&bfdate=03%2D26%2D2002+01%3A16%3A26&author_last=Grossman&author_first=Lawrence&match=exact&options=and), L. and [Upton](http://r1.us.rmi.yahoo.com/rmi/http://shop.barnesandnoble.com/booksearch/results.asp/rmivars%3ftarget=_top?userid=409RIJKS9U&mscssid=0JNTK1GAUEW59KC45M39FTSFTEE0FJ65&sourceid=00033868505897959331&bfdate=03%2D26%2D2002+01%3A16%3A26&author_last=Upton&author_first=Arthur+D%2E&match=exact&options=and), A. D. 1986. Mechanisms of DNA Damage and Repair: Implications for Carcinogenesis and Risk Assessment, Plenum Press, N.Y.
10. Tamarin, R. H. 2002. Principles of Genetics, McGraw-Hill Companies, N.Y.
11. Thomas, A. E. 2010. DNA damage repair, repair mechanisms, and aging. Hauppauge, N.Y: Nova Science Publisher's.
12. [Vaughan](http://www.amazon.com/exec/obidos/search-handle-url/index=books&field-author=Vaughan%2C%20Pat/002-0005045-4235257), P. 2000. DNA Repair Protocols: Prokaryotic Systems, Humana Press, N.J.